METAL INDUSTRY

WITH WHICH ARE INCORPORATED

ALUMINUM WORLD & COPPER AND BRASS

BRASS FOUNDER and FINISHER

ELECTRO-PLATERS REVIEW

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ELECTRO-PLATERS REVIEW

VOL. 32 NEW YORK, OCTOBER, 1934 No. 10

The Electro-Platers' Code

An Extended Abstract of the New Code of Fair Competition for the Electro-Plating and Metal Polishing and Metal Finishing Industry; Effective September 1, 1934*

Article II. Definitions

Section 1. The term "Electro-Plating and Metal Polishing and Metal Finishing Industry" or the "Industry" as used herein means the grinding, polishing, and buffing of any metal part or metal product and/or the electro or chemical deposition of any metal on any metal as a commercial process for sale; including the grinding, polishing, buffing, and/or electro-plating of purchased metal parts for the sole purpose of selling same as plated articles. This does not include the grinding, polishing, buffing, and/or plating in cases where the party completely fabricates the metal part or uses the same as a minor part in assembling the products manufactured by such party.

Article III—Employment Provisions

This Industry is a division of the Fabricated Metal Products Manufacturing and Metal Finishing and Metal Coating Industry and without limitation the wage, hour and labor provisions in Article III of its Basic Code as approved by the President, November 2, 1933, including Section 1 of said Article III, by which the provisions of sub-sections (1), (2) and (3) of Section 7 (a) of Title I of the Act are made conditions of this Supplementary Code, are specifically incorporated herein and made a part hereof as the wage, hour and labor provisions of this Code.

Article IV—Organization, Powers and Duties of Supplementary Code Authority

Section 1. There shall be established a Supplementary Code Authority consisting of 14 members, twelve (12) of whom shall be the Executive Committee of the Institute, and two (2) of whom shall be elected by and from among the members of the Industry who are non-members of the Institute.

During the period from the effective date of the Supplementary Code and until the election of the said two (2) non-member representatives on the Supplementary Code Authority the Executive Committee of the Master Electro-Platers' Institute shall act as a temporary Code Authority with the powers herein given to the Supplementary Code Authority.

Section 4—It being found necessary in order to support the administration of the Supplementary Code and to maintain the standards of fair competition established hereunder and to effectuate the policy of the Act, the Supplementary Code Authority is authorized:

(a) To incur such reasonable obligations as are necessary and proper for the foregoing purposes and to meet such obligations out of funds which may be raised as hereinafter provided and which shall be held in trust for the purposes of the Supplementary Code.

(b) To submit to the Administrator for his approval, subject to such notice and opportunity to be heard as he may deem necessary (1) an itemized budget of its estimated expenses for the foregoing purposes, and (2) an equitable basis upon which the funds necessary to support such budget shall be contributed by members of the Industry.

(c) After such budget and basis of contribution has been approved by the Administrator, to determine and obtain equitable contribution as above set forth by all members of the Industry, and to that end, if necessary, to institute legal proceedings therefor.

Section 7. The Supplementary Code Authority shall have all the powers and duties which shall be

*Complete copies of this Code can be obtained for 5c. from the Superintendent of Documents, Washington, D. C.

necessary or proper to enable it to fully administer this Supplementary Code and to effectuate its purpose.

Without limitation to the foregoing or any other powers or duties provided for in this Supplementary Code, the Supplementary Code Authority shall have the following specific duties:

(e) To appoint within 90 days after the effective date of this Supplementary Code a committee so constituted as to give consumer and governmental representation satisfactory to the Administrator to make a study with a view to the establishment of classifications and standards of size (including thickness of deposit) and quality (grades) of staple products and services of the Industry wherever such standards are deemed feasible. The findings and recommendations of this committee shall be submitted to the Industry and to the Administrator, within one year after the effective date of this Supplementary Code. If a majority of the members of the Industry approve of the findings and recommendations, and after such hearings and investigations as the Administrator may designate, and upon approval by the Administrator, such findings and recommendations shall be made a part of this Supplementary Code and shall be binding upon every member of the Industry.

(f) To recommend to the Administrator any action or measure deemed advisable, including fair trade practice provisions to govern members of the Industry in their relations with each other or with other Industries; measures for industrial planning, and stabilization of employment; and including modifications of this Code which shall become effective only as hereinafter provided in making amendments hereto.

(g) To appoint a Trade Practice Committee which shall meet with the Trade Practice Committees appointed under such other codes as may be related to the Industry for the purpose of formulating fair trade practices to govern the relationships between employers under this Supplementary Code and under such other codes to the end that such fair trade practices may be proposed to the Administrator as amendments to this Supplementary Code and such other codes.

(h) To provide for local Administration of the Supplementary Code through the selection of District Code Committees for the various Industry Districts. Each such District Committee shall be selected by and from the members of the Industry residing within the District in a manner truly representative of the members of the Industry within that District and subject to review by the Administrator.

The District Code Committees shall administer the Supplementary Code in their respective districts and shall have such powers in the administration of the Supplementary Code as may be delegated to them by the Supplementary Code Authority, provided, that nothing herein shall relieve the Supplementary Code Authority of its duties or responsibilities under this Supplementary Code; and that such District Code Committees shall at all times be subject to and comply with the provisions of the Supplementary Code.

Section 8. Each member of the Industry may report to the District Code Committee for his district, or its appointees, any complaints regarding alleged violation of this Supplementary Code by a member of the Industry within a district. The District Code Committee shall attempt to settle the disputes and, if unsuccessful shall forward its recommendations to the Supplementary Code Authority. Any complaint of an alleged violation of this Supplementary Code made by a member of the Industry against another member of the industry located in another district shall be reported to the Supplementary Code Authority.

Section 9. To the extent permitted by the Act and subject to such rules and regulations as the Administrator may prescribe, any and all information furnished to the Supplementary Code Authority by any member of this Industry pursuant to the provisions of this Supplementary Code shall be subject to verification by an impartial agency agreed upon by the Supplementary Code Authority and the member of the Industry in question, and failing such agreement, such impartial agency shall be selected by the Administrator, which impartial agency may check so much of the pertinent books, accounts and records of such member of the Industry as may be required to verify the accuracy of the information so furnished.

Section 11. Every employer shall make reasonable provisions for the safety and health of employees during the hours and at the places of their employment. Standards of health and safety shall be submitted by the Supplementary Code Authority to the Administrator within three (3) months after the effective date of the Supplementary Code.

Article V—Cost Finding

The Supplementary Code Authority shall cause to be formulated methods of cost finding and accounting capable of use by all members of the Industry, and shall submit such methods to the Administrator for review. If approved by the Administrator, full information concerning such methods shall be made available to all members of the Industry. Thereafter, each member of the Industry shall utilize such methods to the extent found practicable. Nothing herein contained shall be construed to permit the Supplementary Code Authority, any agent thereof, or any member of the Industry to suggest uniform additions, percentages or differentials or other uniform items of cost which are designed to bring about arbitrary uniformity of costs or prices.

Article VI—Costs and Price Cutting

Section 1. If the Administrator, upon application of the Supplementary Code Authority or any member of the Industry, after investigation, shall at any time find that as to this Industry or as to any district within the Industry both (1) that any emergency has arisen within the Industry or within the district adversely affecting small enterprises or wages or labor conditions, or tending toward monopoly or other acute conditions which tend to defeat the purposes of the Act; and (2) that the determination of stated minimum prices for a specified product or service within the Industry or within the district for a limited period is necessary to mitigate the conditions constituting such emergency and to effectuate the purposes of the Act, the Supplementary Code Authority may cause an impartial agency to investigate the costs and to recommend to the Administrator a determination of the stated minimum price of the product or service affected by the emergency and thereupon the Administrator may proceed to determine such stated minimum price.

Section 2. When the Administrator shall have determined such stated minimum price for a specified product or service for a stated period, which price shall be reasonably calculated to mitigate the conditions of such emergency and to effectuate the purposes of the National Recovery Administration, he shall publish such price. Thereafter during such stated period no member of the Industry shall sell such specified products or services within any district for which such price has been fixed at a net realized price

below said stated minimum price, and any such sale shall be deemed destructive price cutting and an unfair method of competition. From time to time the Supplementary Code Authority may recommend a review or reconsideration, or the Administrator may cause any determination hereunder to be reviewed or reconsidered and appropriate action taken.

Article VII—Publication of Price

Section 1. The District Code Committee in any district may prepare a list of all articles which are standard articles upon which the service of plating, re-plating, finishing, or refinishing, is generally performed within that district and shall submit such list to the members of the Industry located within the district as a tentative list of products upon which each member of the Industry performing industry services for customers residing in the district shall be required to publish his prices and terms and conditions of sale. Whenever the members of the Industry operating within such district who employ at least 60% of the employees engaged by the members of the Industry in that district, shall have approved such list of standard products or any modification thereof and the same shall have been approved by the Administrator, the District Code Committee shall disseminate such approved list to all members of the Industry known to be located within the district or doing industry services for customers within the district, as the list of standard products on which each member must file with the District Code Committee, his prices, terms and conditions of sale on such services for customers residing within the district. Within ten days after the dissemination of such list each member of the Industry located within the district or performing any industry services for customers located within such district shall file with the District Code Committee or its designated agency such member's prices for the plating, re-plating, finishing, re-finishing of all said standard articles and shall so publish and file all subsequent changes therein or revisions thereof, which shall be effective immediately upon receipt thereof by the filing agency. When any member of the Industry has filed any revision such member shall not file a higher price within 48 hours. Such prices, terms and conditions of sale, and changes therein or revisions thereof as aforesaid so filed shall, for the purpose of this Supplementary Code, be treated as the published prices, terms and conditions of sale within such districts on said standard products of the member filing the same and shall be at all times during business hours open at the office of said District Code Committee or its said designated agency, to all interested parties. Promptly after receipt hereof the Disrict Code Committee, or its designated agency, shall send, or cause to be sent, a copy of all such prices, terms and conditions of sale and all changes therein or revisions thereto to each member of the Industry known to be located within the District or doing work for customers located within the district, or who shall have so filed his prices, terms and conditions of sale or to any other interested party who shall have registered his name and address with the filing agency and who shall pay the cost involved.

Section 2. No member of the Industry shall offer for sale, quote on, or sell to any customer or prospective customer residing within the district, any of its products or services at a price or upon terms and conditions other than those stated in such member's published prices, terms and conditions of sale and changes therein or revisions thereof published and filed by such member in such district, except to another member of the Industry who is complying with the provisions of the Supplementary Code and paying his pro rata share of the expense thereof.

Section 3. If at any time hereafter the Administrator shall give his approval to the requirement that subsequent changes or revisions of any prices, terms or conditions of sale, as provided in Section 1 hereof, shall be filed a specific period of time prior to the effective date thereof, the Supplementary Code Authority may provide that all changes in such price lists, terms or conditions of sale, or revisions thereof thereafter filed, shall be published or filed ten days or such other period of time as may be approved by the Administrator, prior to the effective date of any such subsequent changes or revisions. All the provisions of Section 1 of this Article, with respect to making prices, terms and conditions of sale so filed, open to all interested parties and with respect to dissemination of the same, and all provisions of Section 2 of this Article shall be applicable as to any prices, terms or conditions of sale filed in accordance with this Section 3.

Any member may file with the said District Code Committee or its said agency such changes in his prices or terms and conditions of sale as may be required to meet the changes filed by another member. Changes so filed shall become effective on the same date as the effective date for the changes of such other member first filing as aforesaid, or, if those changes shall have already become effective, then the changes subsequently filed as aforesaid shall become effective immediately upon receipt thereof by the filing agency.

Article VIII—Unfair Trade Practices

Superseding all of the unfair trade practices covered by Article V of the Basic Code the following described acts shall constitute unfair trade practices and any member of the Industry who shall, directly or indirectly through any officer, employee, agent, or representative, use or employ any of such unfair practices shall be guilty of a violation of this Supplementary Code.

Rule 1. No member of this Industry shall sell industry products or perform any services within the scope of the Industry upon terms more favorable than 1 percent for cash payment within 10 days, 30 days net; provided, however, that the cash discount may be allowed for cash payment on or before the 25th day of the month on all invoices issued from the first to the fifteenth day of the month, both inclusive, and the 1 percent discount may be allowed for cash payment on or before the 10th day of the following month on all invoices issued from the 16th day to the last day of the month, both inclusive.

Rules 2 to 10 inclusive are common to most other Codes, prohibiting: commercial bribery; false statements about competitors; inaccurate contracts, etc.

Rule 11. Standard forms of quotations and contracts may be adopted by the Supplementary Code Authority, subject to approval by the Administrator. All quotations shall thereafter be made in accordance with the terms and conditions of such forms of quotations and all contracts shall be made in accordance with the terms and conditions set forth in any standard form of contract so adopted, and any departure by a member of the Industry from said standard terms and conditions in the making of any quotation or contract in any transaction is an unfair method of competion.

Electrochemists Convene in New York

Discuss Rare Metals, New Electric Furnace Products, Corrosion and Electro-Plating

THE Electrochemical Society, an international organization devoted to pure and applied electrochemistry and founded in 1902, held its meeting at the Hotel Pennsylvania, New York City, September 27, 28 and 29, 1934. **Professor B. S. Hopkins** of the University of Illinois, one of the foremost chemists of the country and discoverer of illinium, a metal with many valuable properties, will discuss his researches in the rare metal field. **Professor Felix Trombe** of the University of Paris has invented a new electrolytic cell for making rare metals. Rhenium, a metal discovered a few years ago in Germany, can be electroplated, producing a coating very resistant to muriatic acid, an exceptional distinction. **Dr. Colin G. Fink** and **P. Deren** reported on this new electroplate. Of wide commercial importance is the metal barium, new being produced in fairly large quantities and widely used in the vacuum tube industry. Of special interest is a nickel-barium alloy used in spark plugs, reported upon by **D. W. Randolph** of the A. C. Spark Plug Company. Barium is also an aid in the operation of electric furnaces, according to **M. A. Baernstein**. **Dr. Hans Osborg** of the Maywood Chemical Company, Maywood, N. J., displayed samples of lithium alloys. A very light alloy composed of zinc, aluminum and lithium has properties resembling those of steel. Lithium-copper alloys have found commercial application. **James Critchett** of the Union Carbide Company presided at the Rare Metals Symposium. Thursday morning, September 27th. There were talks on titanium, vanadium, thorium, uranium, calcium, gallium, boron carbide, beryllium and others.

On Saturday, September 29th, there were two sessions. The morning session was devoted to **corrosion** and **electric furnaces,** headed by **Professor F. A. Rohrman** of Houghton, Mich. At the afternoon session **Dr. H. S. Lukens,** President of the Society, presided. The papers were concerned largely with electroplating of metals, including cadmium, tungsten, copper.

A lavish program was provided by the Local Committee. There was a grand dinner Thursday evening at which **Samuel G. Hibben** of the Westinghouse Company entertained with a wonderful talk on Color Symphony, and **Miss Lillian Moore** of the Metropolitan Opera Ballet presented a number of specialty dances. Excursions to industrial plants included visits to the Bell Telephone Laboratories, Philip Sievering, Inc., General Electric Vapor Lamp Company, General Ceramics Company, Standard Oil Development Company, Public Service Electric & Gas Company and Westinghouse Lamp Company.

Abstracts of Papers

THE CO-DEPOSITION OF TUNGSTEN AND IRON FROM AQUEOUS SOLUTIONS

By M. Leslie Holt

Iron is present in the "tungsten" deposits obtained from aqueous tungsten plating baths. Removal of iron from the plating bath by continued use results in a "depleted" bath. A depleted bath can be regenerated by addition of very small amounts of iron, which iron is, however, present with tungsten in the cathode deposit.

ANOMALIES OBSERVED IN THE RATE OF CORROSION OF ZINC

By J. E. Maconachie

In the course of an investigation of the corrosion of galvanized iron hot water storage tanks, two anomalies were found in the rate of corrosion of zinc in distilled water: the presence of maxima in the loss in weight with time curves at temperatures above 50° C.; and the occurrence of specimens which showed marked passivity. Apparatus and technique which gave a large amount of reproducible data are described. The initial corrosion rate of zinc in distilled water is greatly increased by increasing temperature up to about 60° C., above which the rate decreases. The corrosion rate at 60° C., appears subject to an anomalous fluctuation which can only be explained on the basis of a reversal of the corrosion reaction. There appears to be a surface condition, not affected by pickling for half a minute in normal hydrochloric acid, which causes zinc to be extraordinarily resistant to attack by distilled water. The occurrence of this condition is infrequent in fresh sheet, but it appears to a considerable extent after aging. Individual specimens cut from one sheet show differences in their susceptibility to corrosion which appear to be independent of the method of measurement.

THE DEFINITION OF POLARIZATION, OVERVOLTAGE AND DECOMPOSITION POTENTIAL

By W. Blum and G. W. Vinal

Taking the case of the electrolysis of water, with smooth platinum electrodes, as a typical example, the fundamental components of the cell or bath voltage are interpreted. Thereupon revised definitions are proposed and these are discussed at length. Finally the following recommendations are submitted:

1. The "equilibrium reaction potential" is preferably used to refer to the potential based on the free energy of the process.
2. The "decomposition potential" is the minimum potential required for continuous electrolysis.
3. The term "polarization" includes all departures of the potential from the equilibrium potential, and is a measure of irreversibility (excluding IR drop) regardless of whether the products are solid, liquid, or gaseous.
4. The term "overvoltage" preferably refers to the minimum polarization required for any electrode process to occur at an appreciable rate under given conditions.

THE EFFECT OF HEAT TREATMENT ON THE CORROSION OF HIGH PURITY ALUMINUM

By F. A. Rohrman

A study is made of the corrosion of carefully annealed, high-purity cast aluminum which had been subjected to different quenching temperatures. When nearly identical samples of this metal were given the same annealing treatment, yet subjected to different quenching temperatures, a very great difference was noted in their behavior in hydrochloric acid solutions. Furnace-cooled samples and those quenched from a few degrees above room temperature show a slightly greater initial rate of attack, while those quenched from the higher temperatures show a decided intergranular attack which finally results in their complete disintegration. No definite reasons are presented for the anomalous behavior, although several possible explanations are discussed.

A STUDY OF DIFFUSION ON COPPER-PLATED ZINC BASE DIE CASTINGS

By Wilhelm F. Castell

Zinc base die castings are generally copper-plated before nickel and chromium plating. Between the electroplated copper deposit and the zinc in the base metal a diffusion action takes place. The rate of this diffusion depends largely on the temperature to which the plated parts are exposed. At elevated temperatures between 220° and 450°F. (105°-232°C.) the diffusion is quite rapid, while under normal temperatures only a very small amount of copper has been found alloyed with the zinc. Failures of the plated deposit on zinc base die castings on outdoor exposure could not be traced to this diffusion but were found to be due to surface defects, both in the casting and in the electroplates.

BUS-BARS FOR ELECTROCHEMICAL PLANTS

By L. C. Pan

Temperature rise has been the usual criterion in bus-bar design. The so-called "safe current carrying capacity" is determined experimentally under conditions such as exist in power stations. On the other hand, for most electrochemical work the conditions are quite different. Accordingly a formula for the most economical bus-bar cross-section is derived upon the basis of these electrochemical plant conditions, together with such factors as price of bus-bar, interest charges, amortization, price of electrical energy, and number of operating hours per year.

THE OCCLUSION AND DIFFUSION OF HYDROGEN IN METALS

A Metallographic Study of Palladium-Hydrogen

By Donald P. Smith and G. J. Derge

Metallographic evidence is presented showing that the principal entry of hydrogen into palladium is along certain rather widely-spaced members of the octahedral and dodecahedral sets of planes which intersect the surface, and that the hydrogen spreads from the octahedral into other dodecahedral planes. From detailed discussion of the facts it is deduced that the ready diffusion takes place in minute fissures which are not improbably the result of octahedral cleavage. The susceptibility of the metal to attack by etching agents is shown to vary in parallel with the avidity with which it takes up hydrogen from the gas phase and hence also to be related, in all probability, to the presence of the fissures. It is concluded that occlusion by the intra-granular fissures, rather than by grain faces, is of primary importance.

THE BULLARD-DUNN ELECTROCHEMICAL METAL DESCALING PROCESS

By Colin G. Fink and T. H. Wilber

The development of the electrochemical descaling process for steel and other metals is described and the underlying principles discussed. The metal article to be descaled is made cathode in a hot acid sulfate bath containing a small amount of metal salt such as tin sulfate. A protective film of tin or other metal is progressively formed over the cleaned points or areas and all pitting, etching, smudge formation and permanent embrittlement so common in ordinary acid or electro-pickling are avoided. The use of silicon alloy anodes inhibits the oxidation of ferrous ions present in the electrolyte. A long life of the electrolyte is thereby assured, thus doing away with the objectionable, frequent renewals of electrolyte required by the older processes.

THE ELECTRODEPOSITION OF TERNARY ALLOYS OF CADMIUM, ZINC AND TIN

By Lawrence E. Stout and Bernard Agruss

Ternary alloys of cadmium, zinc and tin can be deposited from solutions containing the complex cyanides of cadmium and zinc, sodium stannate, sodium hydroxide and free sodium cyanide. Excellent resistance to corrosion is offered by plates high in tin. Almost without exception alloys containing even small contents of tin withstand salt spray better than non-tin bearing deposits. Deposition of cadmium is favored over the deposition of tin and zinc. A comparatively large concentration of tin in the bath is required to produce an appreciable tin content in the deposit. An increase in the cadmium and tin concentrations in the bath produces an increase in their compositions in the plate. Increasing the zinc concentration in the bath decreases the content of that metal in the plate, at low current densities. At higher current densities zinc behaves similar to cadmium and tin. At 20° C. the tin and zinc contents of the deposit decrease while the cadmium content increases with increasing current density. At 2 amp./dm.^{2} the tin and zinc contents of the deposit increase while the cadmium content decreases with increasing temperature. At 0.5 amp./dm.^{2} the zinc content of the deposit decreases with increasing temperature. The behavior of tin and cadmium do not change.

RHENIUM PLATING

By Colin G. Fink and P. Deren

Bright, hard deposits of rhenium metal were obtained from various aqueous rhenium solutions. Rhenium plates very rapidly and has a good throwing power. Plates of any desired thickness can be obtained. The plate is very resistant to hydrochloric acid. Detailed bath formulas are given. Rhenium may be codeposited with other metals.

ALLOYS OF NICKEL AND BARIUM

By D. W. Randolph

A brief outline of some of the properties of nickel-barium alloys and a description of a new alloy of nickel, copper and barium. A method for producing a stable electron emitting surface without the use of the

usual oxide coating has been developed which will probably extend the use of these barium alloys in vacuum tube construction.

ELECTROLYTIC TREATMENT OF ZINC

By Joseph Schulein

When zinc or zinc-coated articles are treated as alternating current electrodes in a chromic acid bath, the zinc surface is chemically changed and the corrosion resistance is greatly increased. The zinc compound formed on the surface is not definitely known, nor is the theory of the reaction satisfactorily formulated as yet.

Preliminary results on the corrosion resistance of electro-galvanized steel treated by this chromic acid process are recorded.

Other papers of general interest were as follows:

The Production and Utilization of Thorium and Uranium, by J. W. Marden.

Vanadium, by B. D. Saklatwalla.

Europium, a Rare Member of the Rare Earth Group, by B. S. Hopkins.

Calcium: Its Metallurgy and Technology, by C. L. Mantell and Charles Hardy.

A New Electric Furnace Technique: The Use of Barium Flux, by M. A. Baernstein.

Titanium in Metallurgy, by M. A. Hunter and A. Jones.

A Review of the Electrochemistry of Gallium, by H. C. Fogg.

The Production of Metals of the Cerium Group, by Felix Trombe.

The Conductance of Solutions of Electrolytes, by Theodore Shedlovsky, Alfred S. Brown and Duncan A. MacInnes.

The Properties of Electrolytes as Related to Their Constitution, by Charles A. Kraus.

Lithium, by Hans Osborg.

Boron Carbide, a New Crystalline Abrasive and Wear Resisting Product, by Raymond R. Ridgway.

Adhesion of Electrolytic Copper Deposits, by Pierre A. Jacquet.

Re-Babbitting Bearings

THE greatest requirement for success in re-babbitting steel backed bearings, is to have the steel surfaces perfectly tinned before pouring the babbitt. The lesser requirement is to have the tinned surfaces clean and bright, and the babbitt at the correct pouring temperature. For the hard service required of such bearings, the best quality of tin copper babbitt is needed. To unite the babbitt with the steel, the preliminary process of tinning the steel is necessary; otherwise the babbitt will not adhere well enough to prevent loosening in a short time.

The ordinary or old time method of tinning the steel or iron is to heat it high enough to remove any old babbitt, grease or scale. A wash with caustic soda is sometimes needed to clear away the grease. Then rub with a wire brush, using a strong flux of zinc chloride to remove the scale.

A suitable flux may be made as follows: dissolve small pieces of sheet zinc in hydrochloric acid diluted 50-50 with water. Use an earthenware jar large enough for a two-gallon batch where considerable tinning is to be done. The cutting process is best done outdoors so as to avoid the danger from the hydrogen gas produced. This raw liquid is suitable for rough iron work but for automobile bearings it should be refined. First add about 1 oz. of zinc oxide powder to the gallon in order to precipitate the iron that came from the zinc. After the impurities have settled, the clear liquid may be siphoned off or poured directly from the sediment; add about 2 ozs. per gal. of powdered sal-ammoniac to neutralize the acid.

The liquid flux as made above is a stock solution. It can be used directly when tinning copper, brass and bronze in the shop. To make up a flux for steel or cast iron, add about 1 pint of strong hydrochloric acid to each gallon of stock used. Apply with a metal swab. For troublesome cases, as with cast iron, a coating of copper will greatly aid the tinning. The coppering flux is made by adding a 1 to 8 copper sulphate-water solution to an equal volume of the steel flux mentioned above. Bright steel or cast iron will be coated with copper instantly when this combination acid-zinc-copper flux is applied with a brush. The tin will unite firmly with the copper if melted on immediately. Powdered copper oxide, the material used for the plates in Edison batteries, will also copper heated cast iron surfaces. It is mixed with water or alcohol and brushed over them.

A good way to heat the bearings and rod ends is to stand them in an iron pot similar to the one used to melt the babbitt. The heated, brushed and fluxed bearing is rubbed with pig tin until coated. Then the hot bearing is clamped in the heated fixture and poured immediately while the tin is clean and bright. There are some very efficient babbitting fixtures on the market. They are arranged for heating, clamping, pouring and trimming.

The final operation is to set the shims and clamp the parts together, and then clamp the bearing in the fixture on the boring mill. There are several types of mills on the market. A desirable type is motor operated, having two horizontal spindles, one for roughing and one for finishing.

The quick work method of re-babbitting automobile bearings is to use one of the patented tinning compounds that clean and tin the heated steel or iron bearings in one simple operation. These fluxes contain tin, remove oxides, clean fast, and coat with tin perfectly.

To use these quick work fluxes for tinning, heat the bearings in any convenient way, to about 850° F. so that any old babbitt can be removed by jarring off. Then apply the patented flux without further cleaning of the heated parts. Rub it on with a metal paddle —a hack saw blade is ideal. In case of roughness of the steel or iron surfaces, scratch-brush with a steel wire brush before rubbing with the hacksaw blade. The bearings must have enough heat to melt the tin in the flux compound, which is in dry, powdered form.

In some cases the work may be quickened by rubbing the flux over the whole bearing with a cloth. The wiped and hot bearing should be babbitted immediately.—**W. B. Francis.**

The Effect of Remodeling a Melting Plant

By M. W. von BERNEWITZ
Metallurgical Engineer

IN DESCRIBING the melting and correcting plant for type metal in the United States Government Printing Office, in Mining and Metallurgy for July, 1932, it was stated by the writer that the melting plant was to be remodeled. This was completed last year. In his report covering the year 1931-1932 to the Public Printer George H. Carter, the Technical Director makes this statement:

"A considerable amount of time was spent in assisting the Maintenance Division in developing methods of handling metal and drawing up details for remodeling the metal re-melting room. The roof was raised and a steel balcony installed on which dead type is stored in trucks. The type is dumped into the pots by means of a conveyor system, thereby eliminating the shoveling of the metal from the floor, as was formerly done.

"The new equipment consists of three 7½-ton melting furnaces, each equipped with thermostatically controlled gas burners, new molds, and electrically driven pumps for pouring the metal. Fifty steel trucks were also purchased for use in handling the dead type. (8,901,766 pounds or 4450 tons were melted during the year, say 15 tons a day, a 10 per cent increase).

"It is estimated that the gas consumption (7,300,000 cubic feet @ 70 cents/1000 cubic feet, a decrease of 386,000 cubic feet) will be cut approximately in half, owing to the higher efficiency of the new type burners and to the fact that the new equipment will permit the melting, analysis, and pouring of the charge of metal in 8 hours. It was formerly necessary to hold the metal overnight, necessitating two meltings with consequent high gas consumption. Almost double the amount of metal can be turned out daily with the new equipment without any increase in labor. Instead of the work being the heaviest type of manual labor, it is now no more arduous than other unskilled labor jobs in the office."

A visit by the writer to the melting plant revealed the changes made. There is one 5-ton furnace in addition to the three 7½-ton furnaces. This has no automatic feeder, but is filled through a chute from the balcony. It is used for producing stereotype metal and electrotype backing-up metal and is available for emergency use if breakdowns occur at the 7½-ton furnaces. As the Technical Director says, the handling of old metal and of molten metal is now light work. The motor-driven centrifugal pumps satisfactorily transfer the molten metal from the pots to the molds, being easily controlled at the pouring spout. In the melting room are also a dross renovator and a 250-pound type-metal furnace. The whole plant has been coated with aluminum paint and presents a good appearance. The room is kept cool by a fresh-air system providing 8,000 cubic feet of fresh air per minute.

In correcting the 8,901,766 pounds of type metals mentioned, 15,495 pounds of lead-antimony alloy, 32,700 pounds of tin-antimony alloy, 3,775 pounds of tin, and 103,575 pounds of lead were used. The percentages of dross in linotype and monotype metals were 0.38 and 1.83, practically the same as in the previous year. Probably, during the next fiscal year the amount of correction alloys added to linotype metal will be balanced by the dross losses. This point has already been reached in monotype metal, and was reached in stereotype metal, but a change in formula made an increase in correction metals in the latter.

Metallurgists visiting Washington will find this melting and correction plant, in fact, the whole laboratory for tests and controls, to be of considerable interest. Visitors are cordially welcomed and technical men are particularly invited to visit the laboratory, which is in charge of B. L. Wehmhoff.

Hot Tinning Steel

Q.—I will appreciate your sending me a formula for tinning steel. I am having trouble with my hot tinning. The tin does not run off properly; it leaves humps on parts being tinned.

I use a single kettle and the tinning is done on ½" wire rods. What can I do to remedy this trouble?

A.—The lumps on the ½" wire rods may be due to a number of causes. To remedy the trouble, all these, therefore, must be checked up.

1. The tin should be a good quality such as Straits. This tin is softer and gives better results for hot dip tinning than some of the other grades.

2. See that the tin bath is not overheated. Iron in solution in the tin takes away its fluidity and makes it freeze very quickly before it has a chance to run off.

3. By all means use some kind of an instrument to regulate the temperature of the tin bath. DO NOT GUESS THE BATH TEMPERATURE.

4. The bath temperature can be anywhere between 480 and 520 deg. F.; the lower the better. If bath temperatures up to 600° and over are used, the tin has been overheated. To remedy this condition, either part of it or all of it, must be dipped out and replaced with good quality metal. The old tin can be used perhaps a little at a time.

5. The work must be well drained and properly shaken. Draw it very slowly, tipping so that the excess metal will have an opportunity to run off, and not accumulate in corners or other places. Try to drain the tin to one point if possible. Shake well before setting the coating if the coating is set. Lumps are caused by tin contaminated with iron, and from improper draining and shaking.—**W. Imhoff.**

Standards of Quality for Flatware

Approval of Quality Standards Applying to Plated Flatware and Hotel Flatware by the Administration, Under the Code of the Silverware Manufacturing Industry

CODE of Fair Competition for the Silverware Manufacturing Industry provides in Article VII, Section 4, as follows:

"The Code Authority shall, within sixty (60) days after the effective date of this Code, establish a series of quality standards to mark the various grades and qualities of the products of the industry, which when approved by the Administrator, may be used by all members of the industry."

Article VIII, Section 5, of the said Code provides in part as follows:

"No member of the Industry shall * * * * simulate the quality markings as established by the Code Authority and approved by the Administrator, on goods inferior in quality to the standards established for the marks so simulated."

Quality standards applying to plated flatware and hotel flatware were submitted in full accordance with said Code and on August 7, 1934, Hugh S. Johnson, Administrator for Industrial Recovery, approved them.

Details of the Standards are given below.

1. The quality marks "Sectional", "Overlay", "Overlaid", "Spot Plate", "Reinforced" indicate that each and every piece bearing all or any of these marks has an extra deposit of pure silver at the "heel" or base of bowl or tines on spoons and forks. These marks cannot be stamped on any pieces whose overall plating deposits are not equal to "A1" or "Standard" equality as defined in this memorandum, and the extra deposit must be **in addition** to the overall "A1" or "Standard" plating deposits. On higher qualities of silver plate the extra deposits can be **included** in the total overall deposit standards as set forth in this memorandum.

2. The quality mark "XII" indicates that each and every piece bearing this mark has an extra deposit of pure silver at more than one wearing point. For example, heel of bowl and back of handle at end. This mark cannot be used on pieces whose overall plating deposits are not equal to "A1" or "Standard" as defined in this memorandum, and the extra deposit must be **in addition** to the overall "A1" or "Standard" plating deposits.

General Rule No. 1—No quality stamps such as "10 Year Plate", "25 Year Plate", "Lifetime Plate", etc., can be used since such stamp would be in violation of the "Time Guarantee" prohibition in the Code.

General Rule No. 2—It is the avowed intent and expressed desire of all manufacturers of silver plated flatware that quality standards protecting consumers, merchants and manufacturers, shall be established and maintained. In this spirit it is declared—

(a) All marks which may be later developed and used, and which are in the opinion of the Code Authority, imitations or simulations of the marks as established in this memorandum, must be declared a violation of Section 17, Article VIII unless goods so marked conform to the quality standards of the mark so imitated or simulated.

(b) It would also be a violation of Section 17, Article VIII to develop and use such marks as "Best Plate", "Excellent Plate", "Highest Quality Plate" or other marks of this character, which in the opinion of the Code Authority are untrue or exaggerations.

Cutlery Quality Standards

The stamp "Stainless" or "Rustless" can only be used on knives if the blade is made from either Stainless Steel or Stainless Iron.

The stamp "Stainless Steel" or Rustless Steel" can only be used if the blade is made of Grade A Stainless Steel as defined by the manufacturers of Stainless Steel.

The stamp "12 dwt." on a dinner knife and No. 12 on a dessert knife shall mean that knives so stamped will strip 12 dwts. to the dozen on dinner knives and 10 dwts. to the dozen on dessert knives.

The stamp "6 dwt." on a dinner knife and No. 6 on a dessert knife shall mean that knives so stamped will strip 6 dwts. to the dozen on dinner knives and 5 dwts. to the dozen on dessert knives.

	TEASPOON Oz. Silver Per Gross	DESSERT SPOON DESSERT FORK R. B. SOUP SPOON Oz. Silver Per Gross	TABLE SPOON DINNER FORK Oz. Silver Per Gross	BASE METAL
"A1" or "Standard"	2	3	4	18% Nickel Silver
"A1+" or "A1X" or "EXTRA" OR	2 Plus Overlay 2½ No Overlay	3 Plus Overlay 3¾ No Overlay	4 Plus Overlay 5 No Overlay	18% Nickel Silver 18% Nickel Silver
"AA"	3	4½	6	18% Nickel Silver
"Double" or "XX"	4	6	8	18% Nickel Silver
"Triple" or "XXX"	6	9	12	18% Nickel Silver
"Quadruple" or "XXXX"	8	12	16	18% Nickel Silver

Treating Waste From Silver Manufacture

By ERNEST H. SMITH

Metallurgist

Various Types of Scrap Produced and the Methods of Handling Them to Recover the Metallic Values.—Conclusion*

Treatment of Old Plating Solutions

The discarded cyanide solutions from silver electroplating are a very important form of liquid waste as they are usually of considerable volume frequently exceeding one hundred gallons.

These solutions are discarded when they become too impure to be worked satisfactorily, and are of a complex nature owing to the additions of various salts with a view to improving their working properties. They are treated for the recovery of the silver which they still contain and which on an average amounts to about 2 ounces per gallon, but will sometimes be as much as 3 ounces per gallon. As a general rule these solutions are sent direct in carboys to the smelters who have special methods of recovering the silver that are not available to manufacturers. In some cases, however, comparatively small quantities of old solution may be treated in the plating shop.

Three methods are in use for the recovery of the silver in these solutions, which may be described as (1) The Electrolytic Method, (2) The Chloride Method, and (3) The Zinc Method. A fourth method, which may be described as the Evaporation Method, is sometimes adopted for smaller quantities of solution.

From the silver plating shop we have also the residues known generally as vat bottoms. These consist mainly of small particles of fine silver that have become detached from the anodes during working and have settled in the bottom of the vat. Such residues are very rich in silver and are collected and sold to the smelters after sampling and assay to determine their value.

(I)—The Electrolytic Method

Extracting the silver electrolytically from old cyanide solutions is sometimes adopted, where suitable electrical current is available. The procedure is much the same as that adopted in ordinary silver electroplating except that an anode of sheet iron or lead. or of carbon, is used whilst the cathode may also be of sheet iron or thin sheet silver, as thin as practicable, about equal in surface area to the anode. The E.M.F. of the current used should be at least equal to that used in ordinary silver plating which varies from 0.75 to 1.25 volts, and a current density of about 6 amperes per square foot.

Many workers, however, use a much stronger current for treating old solutions in order to recover the silver more quickly, the actual current varying with the condition of the solution.

The silver recovered in this way on the cathode after washing and drying is usually sold to refiners on assay results. The chief objection to this process is that it is somewhat slow especially in removing the last traces of silver in the solution. The method is easy and convenient to work, but when the bulk of the silver has been removed it becomes mainly a question as to whether the value of the remaining silver is more than sufficient to cover the cost of recovering it. Moreover, in the later stages, the copper which is invariably present in these old solutions will be deposited with the silver.

As hydrocyanic acid is evolved during the process, producing a poisonous atmosphere in the vicinity of the vats, the same precautions must be taken as in the case of ordinary silver electroplating to prevent inhaling the gas.

(II)—The Chloride Precipitation Method

In this method which is frequently adopted, the silver is thrown out of solution as chloride by the addition of hydrochloric acid (muriatic acid) or common salt. As usually carried out a slight excess of hydrochloric acid is added to the cyanide solution until all the silver has been precipitated, The solution is then stirred and the silver chloride allowed to settle after which the clear liquid is siphoned off.

The precipitate is washed by adding hot water and stirring vigorously after which it is allowed to settle and the wash water siphoned off. This washing is repeated two or three times.

The clean chloride is pure and can be utilized for making up a new plating solution, or it may be dried and reduced to metal by melting with potassium or sodium carbonate, and the button of silver sold.

This chloride method is fairly simple and quick but it should be performed where there is free access of air in order to lessen the evil effects of the hydrocyanic acid gas which is evolved on the addition of the hydrochloric acid.

(III)—Precipitation with Zinc (or other Metal)

In this alternative method, the silver is thrown out of solution in the metallic state by means of metallic zinc. It is a method that has long been in use on a large scale for the recovery of both gold and silver in cyanide solutions in mining districts.

The silver is deposited on the zinc in a finely crystalline state but being only slightly adherent, it slowly falls to the bottom of the vat forming a mud or sediment which is recovered and then washed, dried and sold to the refiners. In carrying out the method the alkaline cyanide solution is first made slightly acid with

*Parts 1 and 2 were published in our August and September issues.

sulphuric acid, and then a plate of sheet zinc immersed. Excess of acid should be avoided as hydrocyanic acid gas is evolved and the usual precautions are necessary. The quantity of zinc required is about one ounce per gallon of plating solution, but the larger the zinc surface the quicker will the silver be precipitated. When all the silver has been precipitated the zinc is removed and any adhering silver washed off. The zinc can then be kept for further use. The deposited silver is collected and sold to the refiners as before. Any copper in the plating solution will be deposited with the silver. Aluminum acts in the same way as zinc so that scrap aluminum can be used instead of zinc if so preferred. These solutions may also be treated with sheet copper which deposits the silver free from copper.

(IV)—The Evaporation Method

This method is slow and tedious and is only applied to the treatment of comparatively small quantities of old cyanide solution. It is perhaps more applicable to spent gold cyanide solutions than to silver.

The solution is gradually evaporated to dryness in any suitable vessel either by means of heat or by long exposure in a warm place exposed to the air. The residue obtained is then heated to redness, but not sufficiently strongly to fuse it.

The burnt residue is placed in a crucible and heated gradually to the melting point of silver whereby the silver salts are reduced to metal which gradually sinks and collects at the bottom of the crucible. The whole is then cast into an open mould when the silver will be found as a small cake, or button, covered with slag which is hammered off and finally removed by soaking in hot water.

To ensure success in the recovery of the silver by all the processes described they should be carried out by men familiar with the simple chemical reactions involved, and the conditions that are essential to success, and not left to inexperienced subordinates. With careless work the losses of silver due to imperfect recovery may be considerable when calculated on the total quantity of waste handled during the year.

Difficulties in Refining Old Gold

Q.—I did some refining of gold filings in the usual way, dissolving in aqua regia, diluting, precipitating with ferrous sulphate, and I got a clean powder of gold. I melted the gold powder in a clay crucible with flux, and the result was a very hard and brittle gold button, which cannot be rolled.

Please tell me how to get a soft gold button.

A.—Possibly if you remelt this button with borax and some nitre, you may be able to improve its quality. Another plan is to remelt it and drop in a very small quantity of mercuric chloride (corrosive sublimate), in all cases being careful not to breathe the fumes.

Your question is difficult to answer because your trouble may have been due to any one of several causes. Possibly you failed to remove all the silver chloride from your solution before adding the copperas. Possibly after obtaining the gold powder you failed to wash all the excess copperas away. Possibly your crucible was contaminated from some previous melt.

However, the most frequent cause of trouble among beginners is soft solder in the original material. If this is not carefully removed, traces of the tin and lead of which it is composed will be found in your gold powder. These metals, even in very small proportions, will cause brittleness, and usually it is necessary to start in all over again and redissolve and reprecipitate the gold.

Jewelry Metallurgist

Saws for Copper

Q.—What kind of circular saws are best for the quantity cutting of sheet copper?

A.—The problem of cutting sheet copper has been effectively solved by the perfection of the hard-tipped tooth circular saws. These saws are also a success for cutting aluminum and nonferrous alloys, and many of the abrasive materials, such as bakelite and its micarta base, linoleum, ebony asbestos switchboard material, plaster board, moulded brake lining, gypsum wall board, fiber, vulcanized rubber, asbestos pipe covering, etc.

Fig. 1. Solid Teeth With Hard Tips

Two forms of the solid teeth with hard tips as made by the Henry Disston Company are shown in Figure 1. Both are of the straight front type. That at A is undercut while that at B is radially faced. The hard blocks are brazed to the steel saw blade, using thin sheet copper for the binder. The heating is done in an electric furnace and in an atmosphere of hydrogen. The inserted tooth saw is shown in Figure 2. The inserted teeth are used in the larger saws. This type can be refitted when worn, whereas the solid teeth cannot be rebuilt when the hard tips have been broken or worn out. The solid tooth saws may have a finer spacing of the teeth, hence they produce a smoother cut. The inserted teeth are used to cut heavy sections of nonferrous metals and where

smoothness does not matter. It is claimed that the hard tipped saws, though their cost is much higher, will cut from 50 to 250 times as much as the carbon or high-speed steel saws for each sharpening.

The material of hard tips is composed of very fine particles of tungsten carbide. This is coated with cobalt as a cement, then pressed into the desired shapes and heated to about 900° F., so that the blocks can be handled. These are finally heated to about 2,500° F. in an atmosphere of hydrogen, which causes the material to become almost as hard as the diamond. Carboloy is the trade name of the hardened material. Special machine equipment must be used to resharpen the tips, and diamond dust in olive oil is the lapping compound. **W. B. Francis.**

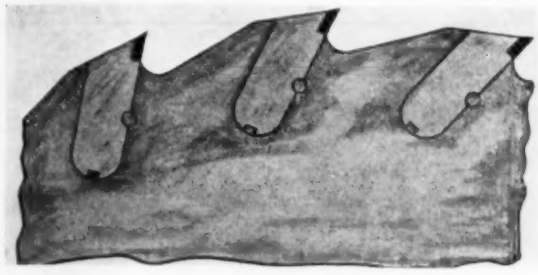

Fig. 2. Inserted Tooth Saw

Proposed Cost Accounting and Estimating System for Non-Ferrous Foundries

The Cost Committee of the Code Authority has Formulated the Following "Proposed Cost Accounting and Estimating System" Which Has Been Reviewed by the Code Authority and is Herewith Submitted to the Various Divisions for Consideration.—Conclusion*

Example Worked Out in Detail

An example of the foregoing cost estimating system as applied to a Non-Ferrous Foundry having about $25,000 sales for a production of about 82,000 pounds of miscellaneous sand castings, other than aluminum, for the preceding year is given below:

I—Cost of Doing Business (Profit & Loss) for the year

Account	Name	Amount
11	Interest on Investment (6% on $10,000)	$600.00
12	Interest on Debt (6% on $5,000)	300.00
13	Dividends on Stocks or Bonds	100.00
14	Research & Development Expense	350.00
15	Bad Accounts	360.00
16	Decline in Market Value	
17	Special Advertising	50.00
	Total	$1,760.00
	Cost of doing business ($25,000)	7.04%

II—Fixed Overhead—for the year

Account	Name	Amount
21	Rent	$1000.00
22	Building Maintenance	600.00
23	Taxes	150.00
24	Insurance	75.00
25	Depreciation of buildings	100.00
26	Depreciation of Equipment	700.00
27	Administration	2000.00
28	Sales	500.00
	Total	$5,125.00

"Normal" business is determined as follows:

Best consecutive 6 months' production since Jan. 1, 1924	100,000 lbs.
Investment in Plant and Facilities during above period	$8000.00
Subsequent added potential capacity	2000.00
Present Investment	$10,000.00
Percent increase in investment—25%	25,000 lbs.
Adjusted Capacity	125,000 lbs.
Normal 6 Months' production 60% of Capacity	75,000 lbs.
Actual production preceding 6 Months	41,000 lbs.
Rate of operation (% of Normal)	54.6%
54.6% of Fixed Overhead $5,125 to be absorbed	$2,798.25
Loss on Fixed Overhead due to low volume business (9.3% of Sales)	$2,326.75

III—Operating Overhead for the year

Account	Name	Amount
31	General Labor	$ 600.00
32	Plant Supervision	1550.00
33	Heat	100.00
34	Supplies	75.00
35	Compensation	150.00
36	Loss on scrap (5% of $25,000 sales)	1250.00
37	Laboratory	100.00
	Total	$3,825.00

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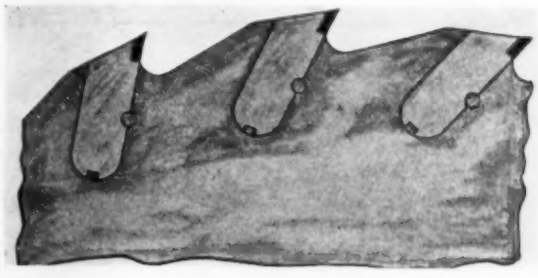

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	Total	$3,825.00

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The portion ($2,798.25) of Fixed Overhead is absorbed in the various departments on the basis of payroll dollars in each department. The entire Operating Overhead is absorbed on the same basis, as follows:

	Department	Payroll	% of Total	Share Fixed Overhead	Share Operating Overhead
V	Melting	$ 300.00	5.0	$ 139.91	$ 191.25
VI	Molding	3000.00	50.0	1399.12	1912.50
VII	Core Making	750.00	12.5	349.78	478.12
VIII	Cleaning	750.00	12.5	349.78	478.12
IX	Finishing	750.00	12.5	349.78	478.12
X	Shipping	450.00	7.5	209.88	286.89
	Total	$6000.00	100.0	$2798.25	$3825.00

IV—Metal for the year

Account	Name	Amount	
41	Raw Metals	$7200.00	(82000 lbs. metal)
42	Metal Expense	300.00	
43	Shrinkage	360.00	(5% of $7200)
	Total	$7,860.00	
	Metal Expense Total	660.00	
	Metal Expense per pound	$.008	

V—Melting for the year

Account	Name	Amount
51	Labor	$300.00
52 (a)	Melting Fuel	150.00
(b)	Supplies	50.00
(c)	Analyses & Tests	50.00
(d)	Share Operating Overhead	191.25
(e)	Share Fixed Overhead	139.91
	Total	$881.16
	Cost of melting per pound	$.0108

Department	VI—Molding Acct.	VI—Molding Amount	VII—Coremaking Acct.	VII—Coremaking Amount	VIII—Cleaning Acct.	VIII—Cleaning Amount
Direct Labor	61	2400.00	71	650.00	81	650.00
Burden	62		72		82	
Indirect Labor	(a)	600.00	(a)	100.00	(a)	100.00
Supplies	(b)	175.00	(b)	70.00	(b)	120.00
Fuel & Power	(c)	25.00	(c)	50.00	(c)	20.00
Share Op. Overhead	(d)	1912.50	(d)	478.12	(d)	478.12
Share Fix. Overhead	(e)	1399.12	(e)	349.78	(e)	349.78
Direct Materials	63	200.00	73	100.00	83	50.00
Totals		6711.62		1797.90		1767.90

Department	IX—Finishing Acct.	IX—Finishing Amount	X—Shipping Acct.	X—Shipping Amount
Direct Labor	91	650.00	101	250.00
Burden	92		102	
Indirect Labor	(a)	100.00	(a)	200.00
Supplies	(b)	200.00	(b)	400.00
Fuel & Power	(c)	50.00	(c)	30.00
Share Op. Overhead	(d)	478.12	(d)	286.89
Share Fix. Overhead	(e)	349.78	(e)	209.88
Direct Materials	93	125.00	103	120.00
Delivery Expenses			104	100.00
Totals		1952.90		1596.77

The departmental Burden on direct labor in each of the above departments then is the sum of (a) plus (b) plus (c) plus (d) plus (e) and these are applied on the basis of direct labor in each case, as follows:

DEPARTMENTAL BURDENS

	Burden	Direct labor Payroll	Burden per dollar direct labor
Molding	4111.62	2400.00	1.71
Core Making	1047.90	650.00	1.61
Cleaning	1067.90	650.00	1.64
Finishing	1177.90	650.00	1.81
Shipping	1126.77	250.00	4.51

SUMMARY OF BUSINESS

Class	Name	Amount
I	Cost of Doing Business	$1,760.00
II	Unabsorbed Fixed Overhead	2,326.75
III	Unabsorbed Operating Overhead	
IV	Metal	7,860.00
V	Melting	881.16
VI	Molding	6,711.62
VII	Coremaking	1,797.90
VIII	Cleaning	1,767.90
IX	Finishing	1,952.90
X	Shipping	1,596,77
	Total Actual Cost	$26,655.00
	Sales Price	25,000.00
	Net Loss for year	$1,655.00

ESTIMATE

No. .....

Customer ..... Date .....

Address ..... F. O. B. ..... Terms .....

Quantity ..... Delivery .....

Part Name ..... Drawing No. ..... Metal No. .....

Type or Size ..... Kind of pattern ..... Wgt. per casting .....

Mold Size ..... Casting per Mold ..... Wgt. Casting per Mold .....

Molds per day ..... Gross Wgt. Metal per Mold ..... Gross wgt. Metal per day .....

Total Specifications:

Copper	Zinc	Aluminum
Tin	Antimony	
Lead	Phosphorus	Impurities

Metal Costs per lb.

	%	@	Amount
Copper			
Tin			
Lead			
Zinc			
Aluminum			
Formula total per lb.			
Metal Expense per lb.			
Total			
Shrinkage			
Total Cost Metal per lb.			

Material Costs on Job	Amount
Total Wgt. of metal ..... @ ..... per lb.	
Patterns, flasks, plates, etc.	
Core boxes, driers, rolls, etc.	
Cutters, band saws, tools, etc. for cleaning	
Tools, dies, wheels, racks, etc. for finishing	
Gauges, testing fixtures, cartons, etc. for inspection & shipping	

Production Costs on Job	Hours	Rate	
Molding labor			
Molding burden			
Coremaking labor			
Coremaking burden			
Cleaning labor			
Cleaning burden			
Finishing labor			
Finishing burden			
Inspection & shipping labor			
Inspection & shipping burden			
Delivery Expense			
Total Job Cost			

Scrap .....% of Job Cost
Cost of doing business .....% of Job Cost
Profit ..... % of Job Cost

Price per piece ..... Price per lb. .....

REMARKS:

Estimated by: .....

Foundrymen's Convention in Philadelphia

Practical Papers Will Feature Nonferrous Sessions October 22-26, 1934

PRACTICAL papers will feature the nonferrous sessions at the Fifth International Foundry Congress and 38th Annual Convention of the American Foundrymen's Association, to be held in the new Convention Hall in Philadelphia, October 22-26.

Besides the general interest sessions, such as those on refractories, sand control, materials handling, and apprentice training, there are to be two technical meetings on nonferrous castings, and a round table luncheon for discussion of problems.

Three papers will be given at the general session on nonferrous castings. The ever-present difficulty of porosity in castings will be discussed in detail by **A. W. Lorenz,** Bucyrus-Erie Company, Milwaukee, Wis., in his paper on **"Porosity in Leaded Bronze Bushings".** Mr. Lorenz will give the results of his experience with this defect, and his method of approaching the problem. He constructed a mold in which he could watch the metal currents, and thus was able to change the gating in such a way as to overcome the porosity.

R. R. Kennedy, metallurgist in the Material Division, War Department, at Wright Field, Dayton, Ohio, has a paper on **"The Effect of Elevated Temperatures on the Strength and Dimensional Stability of Certain Aluminum Alloys Used in Aircraft".** He has made a very intensive study of the effects of different temperatures, different lengths of time, on the various properties of aluminum alloys. His results indicate fields of application for certain alloys, based on the influence of heat on the physical properties.

"Melting Nonferrous Alloys in a Cupola Type Furnace" is the subject of a paper by **W. C. Alvin,** Imperial Brass Manufacturing Company, Chicago. He speaks as a user, and tells the story of his work with this type of melting equipment. He takes up the alloys best suited to the cupola, the advantages and disadvantages of this equipment, the refractories found most efficient, and gives a clear picture of one company's experience with cupola melting of red brass.

The second technical session is a **Symposium on the Deoxidation and Degasification of Nonferrous Casting Alloys.** This subject, one of the most important to the industry, has been determined upon as one to be discussed annually until some definite conclusion is reached. This meeting is the second annual session on this topic.

Recognized authorities will discuss the deoxidation of different kinds of nonferrous casting alloys, advancing opinions as to the theory involved, and giving the results of their use of methods and materials for this purpose. The Introduction, and **"Discussion of General Principles",** will be given by **Dr. C. H. Lorig** of Battelle Memorial Institute, Columbus, Ohio, **A Report on The Deoxidation and Degasification of Bronze Foundry Alloys** will be made by **O. W. Ellis,** director of Metallurgical Research at the Ontario Research Foundation, Toronto, Ontario, Canada, as chairman of a committee studying that subject. **L. A. Ward,** metallurgist for the Chase Brass and Copper Company, at Waterbury, Conn., will discuss **"Yellow Brass Castings Alloys", "Aluminum and Its Alloys"** will be taken up by **H. J. Rowe,** of the Aluminum Company of America, Cleveland, Ohio.

At the Round Table Luncheon meeting, which will follow immediately after the session on deoxidation and degasification, there will be a discussion of practical difficulties which arise in the nonferrous foundry.

Pattern Making to be Subject of Joint A.S.M.E.—A.F.A. session

A symposium on pattern making, featuring modern pattern making practice, will be held jointly by the Wood Industries Division of the American Society of Mechanical Engineers, and by the American Foundrymen's Association.

The meeting, which will be held at the Philadelphia Convention Hall, will be at 2:30 P. M. Wednesday, October 24th. The Wood Industries Division of the A.S.M.E. is conducting a national conference at the Hotel Walt Whitman, Camden, N. J., on October 23rd and 24th, but will adjourn to Philadelphia where the International Foundry Congress is to be held October 22-26, for this meeting.

Paul Bilhuber, Assistant Factory Manager of Steinway and Sons, Long Island, New York, will preside at the session, and Ira B. Turner, of Thomas J. Hunter Co., Philadelphia, who is president of the Association of Manufacturing Pattern Makers of the Philadelphia district, will talk on "Modern Pattern Making Practice."

Shop Course on Sand Control

A shop course on the practical fundamentals of sand control will be a feature of the Convention. Four sessions will be devoted to this course, which has been developed by a committee under the chairmanship of W. G. Reichert, Singer Manufacturing Company, of Elizabeth, N. J.

The schedule of the course is as follows:

Monday, Oct. 22—Application of Sand Control to Continuous and Jobbing Foundries

Tuesday, Oct. 23—Classification of Foundry Sands

Wednesday, Oct. 24—Casting Defects Caused by Sand, Causes and Remedies

Thursday, Oct. 25—Core Sands and Core Binders

An experienced group of leaders will summarize the topic of the day, then will give an opportunity to those present to ask questions about their own problems.

Tentative Program for Non-Ferrous Metals

Monday, October 22

A. M. & P. M.—Registration and Committee Meetings

12:00 **Noon**—Formal Opening of Exposition

4 to 5:30—Shop Operation Courses (Sand Control & Cupola Practice)

7 **P. M.**—Annual Alumni Dinner

Tuesday October 23

10:00 **A. M.—Session 1**—Formal Opening Meeting—International Foundry Congress

2:30 **P. M.—Session 2**—Non-Ferrous

(1) **Porosity in Leaded Bronze Bushings,** A. W. Lorenz, Bucyrus-Erie Co., Milwaukee, Wis.

(2) **Effects of Elevated Temperatures on the Strength and Dimensional Stability of Certain Aluminum Alloys Used in Aircraft,** R. R. Kennedy, Wright Field, Dayton, Ohio

(3) **Cupola Melting of Red Brass,** W. C. Alvin, Imperial Brass Manufacturing Co., Chicago, Ill.

2:30 **P. M.—Session 4**—Apprentice Training

4 to 5:30—Shop Operation Course—Sand Control

9:00 **P. M.**—Reception to Overseas Guests

Wednesday October 24

10:00 **A. M.—Session 7**—Non-Ferrous

Symposium on Deoxidation and Degasification of Non-Ferrous Casting Alloys

(1) **Introduction—Discussion of General Principles,** Dr. C. H. Lorig, Battelle Memorial Institute, Columbus, O.

(2) **Bronze Foundry Alloys,** Committee Report, O. W. Ellis, Ontario Research Foundation, Chairman.

(3) **Yellow Brass Casting Alloys,** L. Ward, Chase Brass & Copper Co., Waterbury, Conn.

(4) **Aluminum and Its Alloys,** H. J. Rowe, Aluminum Company of America, Cleveland, Ohio.

12:30 **P. M.**—Non-Ferrous Round Table Luncheon

2:30 **C. M.—Session 9**—Refractories.

4 to 5:30 **P. M.**—Shop Operation Courses (Sand Control & Cupola Practice)

7:00 **P. M.**—Annual Banquet—Medal Awards

Thursday October 25

10:00 **A. M.—Session 12**—Materials Handling

(1) **Selecting Foundry Equipment as an Investment,** R. J. Heisserman, Link Belt Co., Philadelphia, Pa.

(2) **Foundry Maintenance,** James Thomson, Continental Roll and Steel Foundry Co., East Chicago, Ind.

3:00 **P. M.**—Special Lecture—Annual Business Meeting

4 to 5:30—Shop Operation Course (Sand Control and Cupola Practice)

Friday October 26

10:00 **A. M.—Session 13**—Sand Control and Research

(1) **Comparison of Some Methods Used in Determining the Fineness of Sands,** R. C. Hill, Cornell University, Ithaca, N. Y.

(2) **Analysis of Sea Coal as Applied to Black Sand,** R. E. Aptekar, Ypsilanti, Mich.

(3) **Effect of Silt on Bending Strength of Sands,** Dr. H. Ries, Cornell University, Ithaca, N. Y.

10:00 **A. M.—Session 15**—Refractories

12:30 **P. M.**—Special Visit to Plant of Bethlehem Steel Company, Bethlehem, Pa. Under Auspices of Philadelphia Foundrymen's Association. Trip by Train.

Exhibits open daily at 9:00 A. M. to 5:30 P. M. except Thursday, when the closing hour will be 10:00 P. M.

Note: Annual Football Game Between U. S. Navy and University of Pennsylvania will take place at Franklin Field, Philadelphia, on Saturday afternoon, October 27th.

Galvanizing Spangles

Q.—Enclosed please find two samples cut from galvanized ware and we would much like your opinion regarding them. The spangle we are seeking to put on all our ware is No. 1; the actual spangle we are producing is No. 2.

The following is an outline of our method of galvanizing—

Steel of fairly good quality, pickle and acid in close uniform strength namely, sulphuric acid pickle about 3%, muriatic acid about 45%, iron content of both never exceeds 2% to 4%. Ware is pickled about ten minutes, temperature 160 to 180 degrees. A non-foaming inhibitor used. Ware removed from pickle as soon as possible, washed in clean running cold water then to the muriatic acid wash; then to the galvanizing kettle about 4 lbs. to 6 lbs. of zinc chloride used in the flux daily, coarse grey salammoniac used. Temperature of spelter bath never varies more than 870 degrees to 875 degrees. Aluminum alloy used as a brightening only when necessary. Two pounds of tin added to the bath, one pound in the morning and 1 pound at noon and we are at loss to see where our fault lies.

Perfectly aware that many factors govern the spangle produced, however, we are under the impression there is something added to the bath which keeps the spelter in a uniform state; spangle not varying too much.

A.—If you want the spangle to always be like that shown in your sample No. 1, cut your tin down to a pound a day for a while. This will also mean that you can probably drop the aluminum alloy a little too, as they both form an alloy together. When the work becomes too dull, add the two pounds of tin until it comes back again to the spangle you desire. You will also probably have to add a little more aluminum alloy at the same time. They both go up together and come down together. Just now sample No. 2 shows a little too much tin and aluminum, if the standard spangle desired is that in sample No. 1.

Wallace Imhoff.

British Institute of Metals Meeting

Abstracts of Papers Read at the Twenty-Sixth Annual Autumn Meeting, Held in Manchester, England, September 3-6, 1934

The Improvement of White Bearing Metals for Severe Service: Some General Considerations, by D. J. MacNaughtan.

Development in the internal combustion engine is imposing increasingly severe conditions on the bearings. Consideration is given to the theoretical functions of an ideal white metal, and the manner in which the stresses produced in service tend to cause failure by cracking. Since the normal action of the stresses are compressive, special attention is given to the tension stresses which are shown to lower the fatigue range of the metal and to open up incipient cracks. Based on this analysis the mechanism of crack formation is discussed.

The following directions in which improvement in service behaviour may be secured are considered: (1) diminishing the intensity of the stresses in the metal by modifications in (a) certain features of design; (b) the material used for the liner; (2) increasing the fatigue-resisting properties of the white bearing metal in respect to which results obtained in preliminary investigations of the fatigue properties of high tin-antimony-copper alloys with and without addition of a further element are given.

The Behavior of White Bearing Metals When Subjected to Various Deformation Tests. Part I.—Indentation Tests, by A. S. Kenneford, and Hugh O'Neill, with an appendix on **An X-ray Examination of Babbitt Metal and of the Age-Hardening of Cast Lead-Alkali Alloy,** by G. S. Farnham.

The effect of viscous flow, ageing, and prolonged heating on the resistance to indentation of tin- and lead-base bearing metals has been investigated. Slow tests with a 120° steel cone at 19° and 96°C. show that Babbitt metal containing 1 per cent cadmium or 2 per cent nickel, or a lead-alkali bearing metal, give better indentation results than a plain Babbitt alloy.

The hardness of the different metallographic constituents of bearing metals and their softening on heating to 100°C. have been measured by scratch and micro-indentation tests. The matrices lose 40-45 per cent, and the cuboids 20 per cent of their hardness, but the cuboids in a Babbitt remain somewhat harder than those in a lead-base alloy.

Two new simple tests are suggested. In the first a lubricated 60° conical casting of the alloy is flattened under 100 kg. load for 30 seconds, and the Mallock hardness number determined. By increasing the duration of loading a flow index may be measured on lines similar to "Hargreaves' analysis." Then, by compressing until cracks appear on the extruded edge, the ductility of the specimen and its cracking stress may be measured. At room temperatures the lead-base alloys show relatively low ductility, and this agrees with their low work-hardening capacity as determined by specially conducted ball tests and repeated impact tests with the scleroscope.

The second method employs an instrument similar to the Herbert pendulum, and measures the damping effect. It may not only be used to give rapid indications of hardness at different temperatures, but is also sensitive to the effect of different lubricants.

Part II.—Tensile Tests, by R. Arrowsmith.

The tensile properties of white metal specimens, prepared by gravity die-casting and without any machining, have been determined at room temperature on a Hounsfield "Tensometer." Various casting conditions were examined for each alloy. Babbitt metal with additions of cadmium gave the highest values of limit of proportionality and ultimate stress. The greatest ductility was obtained from an alloy No. INC containing 89 per cent of tin.

Part III.—Pounding Tests, by H. Greenwood.

A modified form of the Stanton impact tester suitable for the testing of white metals by pounding at different temperatures is described. Results on cylindrical specimens are given, and the unsuitablity of this type of test-piece is shown. The use of bearing-shaped specimens with a cylindrical indenter is described. Results are recorded for eight different white-metal bearing alloys and a lead-alkali alloy, cast under varying conditions, and tested at 18°, 100° and 150°C. A Babbitt metal with an addition of cadmium gave the greatest resistance to pounding.

Some Properties of Tin Containing Small Amounts of Silver, Iron, Nickel, or Copper, by Professor D. Hanson, E. J. Sandford, and H. Stevens.

The tin-rich ends of the silver-tin, nickel-tin, and copper-tin equilibrium diagrams have been investigated. With the first, the eutectic occurs at 3.5 per cent. of silver, at 221.3°C.; with the second at 0.18 per cent. of nickel at a temperature which does not vary appreciably from the melting point of pure tin; with the last, between 0.70 and 0.75 per cent. of copper at 226.9°C. The solid solubility of silver in tin is shown to be approximately 0.02 per cent. at room temperature, increasing to 0.06 per cent. at 210°C. The solid solubility of nickel is less than 0.005 per cent., and that of copper less than 0.01 per cent. at 220°C.

The method of making additions to tin is discussed, and it is shown that no particular difficulties are met with in the case of silver, iron, copper and nickel.

The influence of additions of these metals on the tensile strength of tin is discussed. A great increase produced by quenching silver-tin alloys is not permanent at room temperature, whilst with the other three alloys quenching has no effect. Additions of iron above 0.4 per cent are without effect, although up to this percentage an increase of 40 per cent in the tensile strength is found.

Nickel up to 0.3 per cent produces an increase up to 2.1 tons/in. but further additions have no influence. Copper up to 2 per cent greatly increases the tensile strength after all heat-treatments investigated.

Silver is shown to refine the grain of tin, but not to prevent grain-growth at high temperatures. The ad-

dition of iron above 0.05 per cent. or of nickel above 0.06 per cent. prevents such grain-growth, although below these compositions germination takes place. 0.35 per cent. and more of copper prevents recrystallization of cold-rolled tin at room temperature, but annealing at temperatures from 110°C upwards produces larger grains than in alloys of slightly lower copper content.

A Reflectivity Method for Measuring the Tarnishing of Highly-Polished Metals, by L. Kenworthy, and J. M. Waldram.

This paper describes an apparatus and method for carrying out the quantitative assessment of tarnish on highly-polished metals, by reflectivity measurements. The method involves the separate determinations of the specular and diffuse components of reflection, and the use of an empirical formula combining these two properties. The application and validity of the method are illustrated by the results of periodical measurements, and observations made on specimens of pure tin and 2 tin alloys exposed to indoor and outdoor atmospheres.

The Corrosion of Tin and Its Alloys. Part I.—The Tin-Rich Tin-Antimony-Copper Alloys, by T. P. Hoar.

The tin-rich tin-antimony-copper alloys have been examined with regard to their resistance to corrosion by dilute hydrochloric and citric acids and by various tap-waters. The straight 5 per cent. antimony alloy containing no copper is found to be usually somewhat more resistant to these types of corrosion than alloys containing copper.

Soft water produces tarnishing; hard water gives no tarnish, but may give localized attack if there is much chalky deposit.

The Influence of Pickling on the Fatigue-Strength of Duralumin, by H. Sutton, and W. J. Taylor.

In order to assist in the detection of flaws, manufacturing defects, and fatigue cracks in aluminium alloy components it has been customary to pickle or etch the components in various solutions, the main etching usually being effected in an aqueous solution of caustic soda. Wohler-type fatigue tests were made on test-pieces machined from Duralumin bar and the effect of various pickling treatments on the fatigue-strength was investigated.

Pickling Treatment A (2½ minutes in 10 per cent. caustic soda solution at 60° to 70°C.; rinse; 1 minute in 10 per cent. nitric acid 10 per cent. sulphuric acid) lowered the fatigue limit by 31 per cent., but the reduction was very much less after immersion of the test-pieces in boiling water. After a layer of 0.0025 in. thick had been machined off, the pickled test-pieces showed normal fatigue properties.

Pickling Treatment B (2 minutes in 10 per cent. hydrofluoric acid, 10 per cent. nitric acid) lowered the fatigue limit by 15 per cent.

Pickling Treatment C (3 minutes in 10 per cent. sulphuric acid 4 parts, hydrofluoric acid 1 part; rinse; 1 minute in 50 per cent. nitric acid) only lowered the fatigue limit by about 6 per cent. and the reduction was less still, **i. e.,** within the limits of experimental error, when the specimens had been immersed in boiling water after being pickled. This treatment appears suitable for pickling new components to reveal macro-structure and defects, or for etching used components for the detection of fatigue cracks, stress-corrosion, cracks, etc.

Some Properties of Heavily Cold-Worked Nickel, by H. Quinney.

The Curie point of commercial nickel of 99.62 per cent. purity has been found to be 330°C., which is much lower than that generally accepted for pure nickel. After the metal has been subjected to torsional overstrain the Curie point on heating is raised considerably but returns to its original value on cooling. No such effect is observed with mild steel since the strain is relieved before the metal reaches the relatively high Curie point.

Experiments in Wire-Drawing. Part IV.—Annealing of H.-C. Copper Wires of Varying Hardness-Elongation Values, by W. E. Alkins, and W. Cartwright.

In the preceding paper of this series, the authors gave an account of annealing experiments carried out at varying temperatures for varying lengths of time upon a number of samples of wire, approximately one-tenth inch in diameter, drawn with widely varying amounts of reduction, from a single heavy wire-bar of very pure h.-c. copper. The breaking load of the wires was the only physical property then dealt with.

In response to a generally expressed desire, the results of the elongation determinations upon the same wires after the same heat-treatments are now published, though no detailed correlation of the breaking load and elongation data is undertaken.

The results again bring out the fact that the more severely drawn wires become annealed at much lower temperatures than the less hard wires. "Over-annealing", in the sense of a falling-off in percentage elongation values, is apparent when an annealing temperature of 750° or 850°C. is adopted.

Maximum elongation values are obtained by annealing for a relatively long time (12-24 hrs.) at a comparatively moderate temperature (230°-280°C.) wires drawn with a reduction of area of the order of 50-75 per cent.

Crystal Densities of Industrial Brasses from X-Ray Data, by Professor E. A. Owen, and Llewelyn Pickup.

Crystal density values have been obtained from X-ray data of copper-zinc alloys in thermal equilibrium, for compositions in the a-, (a+B), and B-regions. Whilst it is shown that the degree of porosity, cold-work, and grain-size have no effect on the results obtained, it is essential to take into account the heat-treatment given, when interpreting the values of alloys with duplex structures.

The relation between the composition of the pure aphase and its density is not strictly linear, but both that of alloys in the pure B-region and that in the (a+B) region can be taken as linear to a high degree of accuracy. At the phase boundaries (a)—(a+B) and (a-B)—(B) there are discontinuities in this relation.

Densities derived from X-ray data are considered to be nearer the true values than those obtained by any of the other methods hitherto employed, and hence, for copper-zinc alloys in true equilibrium the values obtained are the most reliable standards available for comparison purposes.

Elongation Values of Copper and Copper-Rich Alloys, by Maurice Cook, and Eustace C. Larke.

A study has been made of the effect on elongation values of dimensional variations in test-pieces of copper and copper alloys in strip form. H. C. copper, 70 : 30 and 64 : 36 brass. 80 : 20 cupro-nickel, and

95.5 gilding metal have been investigated, and it has been found that varying the length of parallel portion on 0.5-in. wide test-pieces from 1.5 to 8.5 in. has no appreciable effect on the total elongation values measured on a 1-in. gauge-length. Varying the metal thickness between 0.125 and 0.020 in. does not sensibly affect the elongation, but with metal thinner than 0.02 in. the elongation values decrease with decreasing thickness. With variation in width from 0.25 to 1.5 in. the elongation decreases with decreasing width, the effect being smaller as the gauge-length is increased. Variation in the rate of strain between the limits of 0.06 and 0.55 in. per inch of gauge-length per minute does not appear to affect the elongation values.

The effect of gauge-length on elongation values has been considered in detail for the five materials in the soft condition and for 70 : 30 brass of varying hardness, and a study made of the distribution of elongation along with gauge-length. Values for total and uniform elongation have been obtained and compared with those derived from characteristic formulae such as those of Unwin, Bach, Bertella, and Krupkowski. The extent of the effect of the local elongation due to necking has been investigated and its influence in connection with the effect of position of the fracture on the elongation considered.

Crystal Re-Orientation on Heating Drawn Copper Wires, by G. S. Farnham, and Hugh O'Neill.

The behaviour of a silver-free copper wire reduced 50 per cent. by cold-drawing, has been compared after "low-temperature treatment" (L. T. T.) with that of two silver-bearing wires reduced 59 per cent. and 49 per cent. respectively. L. T. T. hardening occurs in the first, but not in the last of these. X-ray spectroscopy makes it evident that preferred orientation is less developed in the silver-bearing wires. The general effect of L. T. T. at 130°C. is to reduce the amount of (111) preferment, but to cause an increase of (100) preferment. This change-over probably causes "orientation hardening." In the silver-bearing wires, however, the change is only relatively small in extent, and this appears to explain the differences as regards L. T. T. hardening.

The Deformation Lines in Alpha Brass, by Carl H. Samans

A microscopic study of 70:30 brass single crystals of two different orientations which had been reduced 50 per cent. in thickness by cold-rolling revealed the presence of many of the so-called "lines of deformation". X-ray determinations, by the Davey-Wilson method, of the orientations in the rolling plane showed conclusively that the markings were mechanical twins parallel to octahedral planes.

The Spectrographic Detection and Estimation of Minute Quantities of Impurities in Copper, by M. Milbourn.

An accurate and convenient method is described for the detection and estimation of small quantities of bismuth, arsenic, lead, iron, nickel, silver, antimony, and tin in copper. Details of technique, sensitivity, and line intensity comparisons are given.

The Spectrographic Analysis of Some Alloys of Aluminium, by Ernest H. S. van Someren.

The paper describes the technique of analyzing aluminium alloys by means of their spark spectra in the ultra-violet, using the method of internal standards.

Tables are given for the estimation of copper, zinc, iron, silicon, manganese, magnesium, nickel, tin, and cadmium; and also for the detection of lead, antimony, chromium, titanium, and bismuth.

A "Synthetic Spectrum" Method of Analysis and Its Application to the Quantitative Estimation of Small Quantities of Bismuth in Copper, by D. M. Smith.

A method has been devised for the production of "synthetic" spectra as standards for comparison, the spectrum of a standard alloy being exactly superimposed on that of the pure metal which forms the main constituent. The total time of the two exposures is equal to the normal time of exposure of a sample which is being analyzed, and a series of spectra is obtained in which the impurity lines show a systematic increase in intensity. While the method was originally applied to the checking of the reliability of standard samples, it can be used for the quantitative determination of impurities in metals, once the standard calibration curve has been obtained. The application to the determination of 0.0001 to 0.004 per cent. of bismuth in copper is described.

A Note on Some Ancient Copper-Coated Silver Coins of Cyprus, by Stanley G. Willimott.

A number of authentic Greek and Roman coins of Cyprus having the appearance of copper or bronze have been found at different times and places. On archaeological grounds these coins would have been expected to have been silver, and laboratory investigation proved this to be the case, 92.3 per cent. silver being found in one case and 94 per cent. in another.

The cause of this phenomenon was studied and three possibilities were considered:—(1) galvanic action due to the chance contact of silver coins with a less noble metal, e. g. iron, in the presence of water containing copper sulphate as an electrolyte; (2) the electrolytic (cathodic) deposition of copper on silver as a result of contact with an electrolyte charged with copper salts derived from cupriferous pyrites; (3) chemical alteration of the surface of the silver coins by pyro-oxidation of the contained copper as a result of accidental fires.

With regard to cause (1) it was possible to demonstrate this in the laboratory and to coat silver coins with a tenacious film of copper.

The Work of Walter Rosenhain—The Thirteenth Autumn Lecture, by Dr. J. L. Haughton.

The scientific, technical and administrative work of Dr. Rosenhain is reviewed, and a few of the more important parts are briefly discussed.

National Metal Week

As we go to press, meetings of the Institute of Metals Division are being held at the Hotel Pennsylvania, New York (October 2-4). National Metal Week is being celebrated in conjunction with the American Society for Metals, the Iron and Steel Division of the A. I. M. E., The American Society of Mechanical Engineers, the American Welding Society and the Wire Association. The first National Metal Exposition ever held in New York will be at the Port Authority Building, 15th Street and 8th Avenue.

A full report will be published in our November issue.

Copper and Brass in the New Housing Program

THE current trend toward remodeling and rebuilding of business, residental and other structures, the Government as well as industry hopes will aid in a business revival.

The September Bulletin issued by the Copper and Brass Research Association, shows striking examples of how copper and copper alloys have been used to insure beauty as well as permanency in remodeling and building.

Washington's headquartrs at Valley Forge, recently restored as a National Shrine to commemorate the trying winter there which meant so much to the cause

The small stone house that served General Washington's headquarters during his crucial and bitter winter at Valley Forge. Rebuilt, its flashings, gutters and downspouts are of copper. Brass hardware and piping have been installed

of American Independence, has been rebuilt, using copper for flashings, gutters and downspouts. Brass piping and solid brass hardware likewise have been installed throughout.

Another interesting story is that of two hotels, one in Ohio, the other in Georgia. A complete renovation that thoroughly modernized a 16-year-old hotel and directly accounted for an almost immediate 33 per cent increase in business is pointed to with pride by the management of the Hotel Carter, in Cleveland, Ohio. The keynote of most complaints had been the uncertain flow of hot water, along with deficient heating. To prevent a recurrence of this condition extra heavy copper pipe with sweat fittings and valves was installed. Many plumbing fixtures were replaced with chromium-plated brass. Similar economical replacement occurred in the Hotel Dempsey, in Macon, Ga.,

Richly finished in wrought brass and tone black, the eagle and torch design of the White House bracket was popular in Washington's time

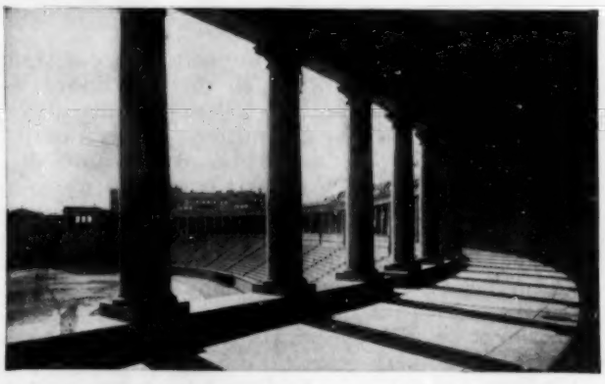
where brass was substituted for corroded galvanized pipe, and sheet copper for glass as a covering for the marquee.

Twenty-four tons of corrosion-resistant sheet copper have just been applied to protect and preserve the concrete construction of the Lewisohn Stadium of the College of the City of New York.

The use of copper and its alloys at the Century of Progress exposition in Chicago is extensive. The "House of Tomorrow", in the Model Home Group is the first all-copper and glass house in the world. There is lavish use of chromium-plated copper in the Ford exposition building—20,000 square feet of the material having been put in service.

Other uses of copper and brass in the housing program are also interesting. There is modern tubular furniture, which has come very much into vogue and many types of period lighting fixtures, filling a need long felt by architects.

Left—A simple Chase presentation in wrought Brass with an antique tin finish . . . the Pine Tree Shilling Sconce, which takes its name and center decoration from the famous Bay State coin of 1652



Above—A Stadium vignette . . . Copper trimmings will be treated with Cabra patina to give speedily the green tone of weathered copper

EDITORIALS

Specifications for Plating

RECENT meetings and publications have released news which points to great possibilities for improvement in the plating industry from a technical and also a business standpoint. At the last meeting of the American Electro-Platers' Society, a report was read on the results of the research carried on by the Bureau of Standards on the protective value of plated coatings on steel. The findings should be learned by heart.

1. The protective value of nickel coatings depends principally upon their thickness. At least 0.001 inch is required for good protection in severe exposures and at least 0.0005 inch in mild exposures.

2. The conditions of nickel deposition have very little effect on the protection against corrosion.

3. An initial or intermediate layer of copper reduces the protective value of thin coatings, but if the total thickness is 0.001 inch or more, the copper is not detrimental, especially if chromium is finally applied.

4. The conditions of copper deposition have very little effect, but if the copper is buffed before the nickel is applied, the protective value is slightly increased above that of unbuffed copper.

5. A very thin layer of chromium, such as 0.00001 inch, usually decreases the protective value of nickel deposits. The customary thickness of 0.00002 to 0.00003 inch of chromium adds very little to the protection against corrosion, but it increases the resistance to tarnish. Thicker chromium deposits such as 0.00005 or 0.0001 inch increase the protection against corrosion, especially in an industrial atmosphere.

6. A layer of zinc or cadmium under nickel or chromium tends to produce white stains and blisters.

Zinc and Cadmium Coatings

1. In all atmospheres, thin coatings of either zinc or cadmium furnish better protection against corrosion than thin coatings of copper, nickel and chromium.

2. In an industrial atmosphere cadmium lasts only about two-thirds as long as an equal thickness of zinc.

3. In two years there has been practically no failure of even thin coatings (0.00002 inch) of either zinc or cadmium in purely marine or rural exposure.

The next step is of course, the setting up of standard specifications, toward which the first move was a Conference held at the Hotel Pennsylvania in New York, September 26th by committees of the American Electro-Platers' Society and of the American Society for Testing Materials. At this Conference were discussed tentative specifications for the plating of nickel, chromium, zinc and cadmium on steel, and also the proposed program for exposure tests of plating on non-ferrous metals, such as copper, brass, zinc and die castings.

The effect of such specifications on the commercial industry will be very great. To be sure they will not be binding, nor will they be forced upon anyone who does not want them. They will be set up as guide posts to direct the purchaser in the direction of products upon which he can depend, and to enable the plater to set fair prices for the definite kind of work which the customer will require. It will go a long distance toward the elimination of misleading quotations and it should take a large part of the buncombe out of unreliable claims for quality.

The Platers' Code

THE leading article in this issue gives an extended abstract of the recently approved Code of Fair Competition for the Electro-Plating Industry. Necessarily, only those parts which differ from other Codes are reprinted as the standard provisions which appear in all Codes appear also in the platers' Code. Its approval is of such importance to the jobbing industry that it is in order here to point out the salient details.

We must bear in mind that it is the result of unselfish and untiring efforts of the Institute's officials and staff. On January 20 a meeting in Cleveland was held without semblance of a Code; six weeks later the Code had been drafted and approved by the industry; a month later it was filed. The balance of the time was taken up in constant negotiation with the Administration.

In the first place, the industry is defined to include all plants doing grinding, polishing, buffing, and electro-or chemical deposition of any metal, whether it is the sole business of the concern or the major part of its business. It does not include the metal manufacturers who completely fabricate their products adding the finish only as a minor part. This exclusion was made advisedly in order to keep the control of the industry within the hands of those who depend upon it primarily.

Here are some of the duties and powers which the Code Authority will have:

1. To appoint a committee with consumer and government representatives included, to make a study with a view to the establishment of classifications and standards for plating; these standards later to be made effective and binding.

2. To recommend additional fair trade practice provisions, measures for industrial planning and measures for the stabilization of employment.

3. To confer with other industries by means of joint committees to govern relationships existing between them; for example with suppliers and with customers.

The administration of the code will be carried on through District Code Committees which will act as agents of the Code Authority. This is obviously the only practical method as the industry is largely local in character.

Standards of health and safety will be set up as protection for the employees.

Methods of cost finding and estimating will be devised and made available to all members of the industry.

In emergencies, the industry may go so far as to arrange for the fixing of definite minimum prices for specific products.

The District Code Committees are empowered to prepare lists of articles which are standard, and upon the agreement of a sufficient number of members in the industry (those who employ 60% of the total in the district), can have this list approved by the Administrator. Thereafter the District Code Committee will distribute these lists and call for all members of the industry to file their prices, terms and conditions of sale for such articles. In other words, this is the "Open Price Plan." It is not "price-fixing." Every member of the industry may quote such prices as he sees fit, but those prices must be made public and adhered to.

The last two provisions above are of the utmost importance as stabilizers of the industry.

Outstanding features of the trade practice regulations are (1) the setting of terms, at 1%, 10 days; 30 days net, and (2) the provision for the adoption of standard forms for quotations and contracts. These standard forms will go far in stabilizing prices as they should set forth definitely what the work contracted for should consist of.

Here then is the instrument, the tool which the trade needs. From now on, it is up to the industry to govern itself and to put its own house in order. Opportunity is given for self-regulation and for co-operation with suppliers and customers. The results are up to the platers.

It will be necessary, however, to remember the advice given by Leo Jensen in the August issue of the Monthly Bulletin of the Master Electro-Platers' Institute. Orders for jobs will not spring from the pages of the Code. The industry will continue to be influenced by general business conditions. All that this Code or any other system can do is to mitigate the severity of declines and to increase the good effects of rises. It cannot manufacture good times, but it can, if lived up to and loyally supported, make bad times bearable and good times better.

The State of Trade

IN our August issue we commented upon the fact that the summer decline was steeper than seasonal variations could account for and that our hopes were resting on the coming fall. The fall is now here.

The last part of the summer showed that, contrary to the slight pick-up in August which generally occurs after seasonal declines of the early summer months, the trend of manufacturing activity was downward, according to data from 25 manufacturing industries that report to the National Industrial Conference Board. The number of wage earners employed in August was 1.6% less than in July; total man hours of work fell off 3.4% and pay rolls 3.3%. At the same time average hourly earnings rose from 58.7c to 58.8c. Further declines in business were recorded in the first half of September when a seasonal improvement should have gotten under way. Building, engineering construction and contract awards were practically unchanged, steel and iron output fell off until about the middle of September, when a rise began which is still continuing at the time of writing, but operating percentage rates are still in the low twenties. The textile strike was of course, the cause of a precipitous decline in that industry.

Since the middle of September some improvement has been noted. As stated above, steel operations are beginning to pick up. Security prices have also risen slightly. The bright spot on the horizon is the fact that retail sales have been holding up surprisingly well and are continuing in their firm to upward trend.

The situation in the metal industries parallels the general condition very closely. After a bad summer, the fall pick-up has been late and slow, even though some evidences of it are now appearing. Perhaps more improvement will come later in the fall.

It will be welcome.

Marine Fires and Metal Polishes

THE horrifying disaster to the steamship Morro Castle off the shore of New Jersey early in September has shocked the world. Of the moral implications involved, there is no need to write here, as they have been amply discussed elsewhere. Of importance to us as an industry, however, is the fact that we have been brought into the picture. One of the possible reasons given for the outbreak of the fire was the use of inflammable metal polishes.

An article recently published in the trade press by C. S. Kimball of Foster D. Snell, Inc., throws considerable light on this subject. It seems that there are several types of liquid polishes: (1) neutral, naphtha-base; (2) naphtha-base, ammonia; (3) water-base, pine-oil; (4) water-base, ammonia; these covering about 99 per cent of the total sales. The oldest type is the neutral, naphtha-base.

One of the things to bear in mind as a complicator of the situation is that the worker generally prefers a chemical rather than an "armstrong" or "elbow grease" cleaner. It has often been stated that the inflammable, naphtha-base polishes call for less effort than the non-inflammable, and are therefore purchased by the men, even though in many large cities they are subject to definite restrictions against their storage, while the water-base polishes are perfectly safe.

In the past, cyanides have also been used but Federal and State legislation has been responsible for the elimination of these and other poisonous ingredients.

Regardless of the effort involved in polishing with the inflammable or non-inflammable mixtures, there is of course, no excuse for the use of dangerous liquids of this type when safe preparations are available. Undoubtedly, however, this problem would be automatically eliminated if the market were assured of a safe preparation which was as easy or easier to use than the unsafe.

Attend the Foundry Convention

FOR the first time in some years, the Convention of the American Foundrymen's Association will be held in the East—Philadelphia, October 22-26. The program is featured by practical papers in the non-ferrous division, the round table discussions with their freedom from restrain, and a special shop course on the practical fundamentals of sand control. The papers and discussions include a good range of subjects, bronze, brass, aluminum, deoxidation and degasification, refractories, materials handling, sands and pattern making.

There is no better place than these conventions to get new ideas on methods, processes and equipment to keep the foundry on its toes.

Correspondence and Discussion

Polished Surfaces

To the Editor of **Metal Industry:**

I would like to submit the following comments on an article and an editorial from the June 1934 issue of **Metal Industry,** page 198.

The article was titled, "Polished Metal Surface is Molten". In this article the disappearance of sprayed zinc into polished copper was evidence that the surface is molten. Was this your abstractor's conclusion or the author's? The conclusion does not appear warranted on this evidence.

Zinc will diffuse into unpolished copper which does not possess the "amorphous", or liquid skin, as is often assumed to be present. This has been done repeatedly in our laboratory at as low a temperature as 100°C. Zinc enters into solid solution with copper to over 30% zinc and after that a new phase appears. This would account for the disappearance of the zinc for twelve bombardments. The "amorphous" skin produced on metals by buffing is not amorphous but is crystalline. The crystallites are of the order of 10,000 inter-atomic diameters because at this size the rates of crystalline breakdown and recrystallization are balanced.

In your editorial titled, "Polished or Unpolished Surfaces", you discussed contradictory results of different reports on chrome plating nickel. From actual experience chromium will deposit more readily on bright unbuffed nickel than on buffed nickel. This agrees with the findings of J. Korpium and Ernst Vogel. I believe the confusion has resulted in failing to consider the length of time the nickel is exposed to air after plating in regard to bright nickel and after buffing, in case of dull nickel. The ease of coverage in chrome plating is dependent on the thickness, conductivity and continuity of the oxide film formed on the nickel. I believe the crystalline structure of the nickel only influences the ease of chrome coverage to the extent that it influences the oxide characteristics.

Bright nickel has little or no oxide coating when freshly plated; freshly buffed nickel has a film of molecular dimensions, whereas old nickel deposits may be coated with oxides sufficient to prevent any chromium deposition.

Our experience substantiates that of Korpium and Vogel rather than that of Claymann.

W. R. MEYER
General Electric Company,
Works' Laboratory

Bridgeport, Conn.

New Books

The Modern Coppersmith, by L. A. Voss. Published by Edwin A. Scott Publishing Company. Size 5 x 7; 400 pages. Price $5.00.

This book is a manual on the working of non-ferrous sheets and tubes, prepared by a practical coppersmith with wide experience in all branches. The text includes details of the materials, tools and equipment used and a description of all the processes involved, such as joining, riveting, seaming, brazing, welding, forming, finishing, pipe fitting, reducing, bending, making dome shaped tops, cup joints, taking off branches, etc.

The outstanding feature of this book is its extremely practical nature. Examples are the step by step explanations of the work involved, making specific objects like a varnish kettle, a jacket kettle, a cone shaped air chamber, etc.

Practical Everyday Chemistry, by H. Bennett. Published by the Chemical Publishing Company. Size 5½ x 8; 305 pages. Price $2.00.

This is a book on chemistry for the layman, concerned not with theory or fundamentals but with the practical compounding and applications. For example, compositions and methods of mixing are given for products in an extraordinarily wide variety of industries covering adhesives, agricultural and garden specialties, coatings—protective and decorative—such as lacquers, paints, varnishes, etc., cosmetics and drugs, etc. Sections are devoted also to metals and alloys, and one chapter is given over to electroplating, chromium, cadmium, gold, nickel and silver.

The book does not claim to be a text book for the skilled worker in his own field. It is rather a reference for those who are interested in subjects outside of their daily work and who need a simple, clear guide to help them in their hobbies. As such it is very useful.

Arsenical and Argentiferous Copper, by J. L. Gregg. Chemical Catalog Company. Size 6 x 9; 189 pages. Price $4.00.

This book is a monograph prepared by the Technical Staff of the Battelle Memorial Institute, in a research supported by the Calumet and Hecla Consolidated Copper Company. The monograph is one of the most authentic and complete on the subject, but in addition it includes a considerable amount of information on copper in all its phases. Among the results presented here for the first time or adequately stressed is the description of the effect of arsenic on the properties of tough pitch copper in both the cold rolled and annealed condition and the effects of increasing amounts of silver on the softening of cold rolled copper during tinning.

The scope of the book can be judged from its chapter headings: Historical and General; Properties and Uses of Copper; Constitution of Arsenic and Argentiferous Copper; Electrical and Thermal Properties; Mechanical Properties; Corrosion of Arsenical Copper and Brass; Uses of Arsenical and Argentiferous Copper.

Government Publications

United States Government publications are available from the Superintendent of Documents, Government Printing Office, Washington, D. C., to whom proper remittance should be made to cover price where a charge is mentioned. In some cases, as indicated, apply to governmental body responsible for publication.

Copper Wire Nails. Simplified Practice Recommendation R150-34. Price 5c.

Tin in 1933. Advance Summary. Domestic tin production was practically nil. Imports for consumption rose from 34,800 long tons in 1932 to 63,700 long tons in 1933.

Nickel in 1933. Advance summary. U. S. Bureau of Mines, Washington, D. C. World output was 49,000 tons in 1933 of which 87% was supplied by Canada; 9% by New Caledonia and very small amounts elsewhere including 126 tons in the United States as a by-product of copper refining. Net imports of nickel into the U. S. amounted to 19,000 tons. The United States recovered 1650 tons of secondary nickel in 1933 compared to 1450 tons in 1932. Value of nickel imported by the United States was about $10,750,000 in 1933 compared to about $4,700,000 in 1932.

Antimony in 1933. Advance summary, U. S. Bureau of Mines, Washington, D. C. Antimony shared in the general improvement of 1933 over 1932. Average price rose from 5.62 to 6.51. Imports, production of antimony ore and concentrates and recovered by secondary antimony also rose. Stocks of antimony in bonded warehouses declined.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

Barrel Plating Cadmium

Q.—Enclosed you will find a bottle of cadmium solution that we are using. Am also sending you 2 pieces of the work we are having trouble plating. It seems that no matter how much power we use we cannot plate the inside. The piece of work I am sending is supposed to be plated inside and out but as you can see it only plates so far. We are plating them in a barrel with the solution at room temperature. The barrel we are using is made of Bakelite and the holes are ¼". No matter if we only put 5 pieces or 500 pieces in the barrel with all the current on they will not plate in the inside. I would appreciate it if you will tell me what is the matter.

A.—Analysis of cadmium solution:

Metallic cadmium	5.76 ozs.
Free cyanide	14.02 ozs.

This solution is in good operating condition, and no corrections are necessary. We do not believe that you will be successful in plating the inside of the tubes in a barrel solution. This class of work should be racked and plated in a still solution.

O. J. S., Problem 5,322.

Cyanide Copper Tarnish

Q.—We have a cyanide plating solution which we operate hot, and are using it for flashing as well as ordinary plating. We have had considerable complaint that the flash is not of the proper color. We find the work will tarnish very easily, and in some cases after they have been standing about for a while the copper will turn a dark blue, and very nearly black. It will also become very streaked. They are of a good color when they leave the tank but it is after they have been standing that they turn color.

We do not sawdust tumble them to dry them, since the cavities will fill with sawdust, and then too, it leaves a fine dust on the surface. These parts are coated with lacquer and bronze powders, and any fine dust on them well show up when they are finished if we use sawdust. We therefor dry them over a hot steam coil after rinsing in clean hot water.

You will also see on the sample, rough spots that appear to be rust. These parts dry rapidly, and we cannot understand why they should develop a rust after they have been standing except there is some action on the steel from the solution. Can you advise some dip that will prevent this, and yet not leave the parts greasy? Or do you think there is some other trouble somewhere. We are mailing you a sample of the part before plating and also after.

USE THIS BLANK FOR SOLUTION ANALYSIS INFORMATION

Fill in all items if possible.

Date.....

Name and address: .....**Employed by:** .....

Kind of solution: .....**Volume used:** .....

Tank length: .....**width:** .....**Solution depth:** .....

Anode surface, sq. ft.:.....**Cathode surface, sq. ft:** .....

Distance between anode and cathode: .....**Kind of anodes:** .....

Class of work being plated: .....**Original formula of solution:**.....

REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible.

Use separate sheet if necessary. _____

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY, 116 John Street, New York City.

We would also like to know of some means of testing our solution for cyanide and copper content. We have a set for the cyanide test, but it does not seem to be accurate enough. The set will test the cyanide content at .75 to 1 oz. per gallon, and yet the anodes will remain black unless we add more cyanide, (free cyanide).

A.—The reason for the tarnishing of the copper plated articles is probably the use of a larger quantity of hyposulphite of soda than what is necessary in the copper solution.

This is probably the reason, also, why you are compelled to use the quantity of free cyanide to keep the anode clean. Your method of drying is also poor, and this is the cause of the rough spots.

We would suggest that you use denatured alcohol for a rinse, and then use a centrifugal drying machine to thoroughly dry the work.

Have some one make a chemical analysis of your solutions to determine the different constituents. If you do not know any one who does this kind of work, send us samples of the solutions, and we will do it for you. —O. J. S., Problem 5,323

Excess Iron in Copper Solution

Q.—Please advise what to do with acid copper solution to reduce excess iron.

A.—There is no way that we know of to remove iron from acid copper solution without harming the solution. Advise discarding the solution and making a new one.

—O. J. S., Problem 5,324.

Green on Antimonial Lead

Q.—We have been experimenting with the putting of a green patina finish on white casting metal, but so far have been unsuccessful in our results. It has occurred to us that you may be in a position to give us some definite information concerning this process.

A.—We doubt very much whether you will be able to produce a satisfactory green patina finish upon the white metal casting by the corrosion method.

Formula for the verde finish:

Copper nitrate	8 ozs.
Ammonium chloride	4 ozs.
Acetic acid	4 ozs.
Chromic acid	1 oz.
Water	1 gal.

This solution can be used by dipping the work into the solution or it can be used by painting upon the work by using one-half the amount of water.

An imitation verde finish can be produced by using copper carbonate mixed with a solution of gum arabic. This is painted upon the work and after drying the excess is removed by using a cloth moistened with water. —O. J. S. Problem 5,325.

Oxidizing Copper

Q.—We have subscribed to **Metal Industry** for some time, and have noticed that you maintain a solution analysis service. We are having some difficulty with our cyanide copper plating bath, and are forwarding herewith samples of plating solution and of copper plated work for your inspection.

In our process we copper plate irregularly shaped pieces of copper alloy, which are afterwards oxidized. The copper alloy is composed of 65% copper, 18% nickel and 17% zinc. The oxidizing solution is made up of 2 oz. per gallon of antimony sulphide and 5 oz. per gallon of sodium hydroxide.

Our plating procedure is as follows:—burnished metal is placed in plating barrel and cleaned in electrolytic cleaner at boiling temperature for three minutes; dipped in sodium cyanide solution of 4 oz. per gallon concentration; rinsed in cold water; plated 45 minutes with six volts.

From past experience we have observed that a heavy, fine grained, dull plate is the most suitable for oxidizing purposes. At the present time we are getting a thin bright plate which is quickly removed when immersed in the oxidizing solution, and when not removed on oxidizing, becomes spotted exposing the copper plate when burnished. We have made several analyses of the bath, and have slowly changed the ratio of the free cyanide to the copper cyanide in an effort to find the proper working point, but have met with no success. We have also adjusted the carbonate content to what we believed to be the proper concentration, and come to the conclusion that the trouble was not in the bath. All during our experiments we observed that the bath voltage was unaffected, and that the bath voltage remained below two volts, while the amperage varied from twenty-five to thirty-five amperes. In our smaller bath of the same type, the best results are obtained with a bath voltage of three to five volts, and amperage ranging from twelve to fifteen amperes.

Any advice you can give us in this matter will be greatly appreciated.

A.—Analysis of cyanide copper:

Metallic copper	7.00 ozs.
Free cyanide	2.92 ozs.

This solution should be operating satisfactorily and believe that you will have to look elsewhere for the trouble.

The samples submitted have a very thin deposit of copper and this indicates that the proper current density is not being used. This may be due to poor contacts, or it may be due to faulty construction of the plating barrel or the tank rheostat.

—O. J. S., Problem 5,326.

pH Adjustment

Q.—We have recently acquired a rhodium plating solution size approximately one gallon. Since we have the solution in our shop, we find that certain metals must be nickel plated before a rhodium plate can be applied namely, silver, brass and base metal. In view of the above facts we have tried to procure necessary data on the building of a small nickel solution of a size as mentioned above. We have received the formula, however, at the bottom of the formula the writer advises that "after all the salts have been dissolved the pH must be adjusted to 5.8 which is very important."

Our experience in plating is limited therefore the technical term pH is greek to us as is the other condition of being adjusted to 5.8. Can you clarify the matter for us and advise us what is meant by the above terms and figures.

A.—The pH of a nickel solution refers to the degree of acidity at which the solution is to be operated, and the pH is adjusted to a certain degree by adding either sulphuric acid or ammonium hydroxide to the solution.

Control sets can be purchased from advertisers in the **Metal Industry** and by their use it can be readily determined what the pH of the solution registers. If the pH of the solution is higher than what it is to be operated at, then sulphuric acid must be added to the solution. If the pH is lower, then ammonium hydroxide must be added to the solution.

—O. J. S., Problem 5,327.

Upkeep of Copper Solutions

Q.—Please advise me as to where I can get information on the upkeep and doctoring up of sick solutions. Have just installed a cyanide copper solution. It is to be used as a strike on brass castings, then nickel plated, and then chrome plated over the nickel. Please advise as to the upkeep of this copper solution.

Shall I just add copper cyanide, or all the chemicals the formula called for?

A.—The best way to maintain your solutions is by chemical analysis. If you are not equipped to do this, have it done at intervals by some one who can do this for you.

Cyanide copper solutions as a rule give very little trouble, unless excess of cyanide is added or too high a current density is used, when the deposit will blister. For a strike solution such as you wish to use the free cyanide can be kept higher than if heavy deposits are to be produced.

If the solution is operated warm, and used continuously, add ⅛ to ¼ oz. of sodium cyanide per week, and occasionally a small amount of copper cyanide.—O. J. S., Problem 5,328.

Patents

A Review of Current United States Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,956,971. May 1, 1934. **Method for Inhibiting the Nitridation of Magnesium.** Edwin O. Barstow, Midland, Mich.

1,957,061. May 1, 1934. **Pouring Device.** Max W. Goldberg, Port Washington, Wis.

1,957,131. May 1, 1934. **Corrosionproof Battery Terminal.** Thomas A. Brown, McKinley, Oreg.

1,957,283. May 1, 1934. **Electrolytic Vat.** Vladmir Obiedoff, Paris, France.

1,957,284. May 1, 1934. **Electrolytic Process for the Production of Magnesium.** Vladmir Obiedoff, Paris, France.

1,957,287. May 1, 1934. **Molding Machine.** Earl F. Oyster, Shaker Heights, Ohio.

1,957,351. May 1, 1934. **Method of Removing Metal from Metal Articles.** Samuel R. Oldham, Chicago, Ill.

1,957,354. May 1, 1934. **Process of Protecting Light Metals Against Corrosion.** Pierre Prier, Paris, France.

1,957,488. May 8, 1934. **Acid Inhibitor.** William S. Calcott, Penns Grove, N. J., and Ira E. Lee, Wilmington, Del., and Louis S. Bake, Penns Grove, N. J.

1,957,527. May 8, 1934. **Spraying Construction.** William R. Brown, Chicago, Ill.

1,957,686. May 8, 1934. **Spraying Device.** William H. Andrews, Cleveland, Ohio.

1,957,705. May 8, 1934. **Spray Gun.** John E. Ferguson, Bloomfield, N. J.

1,957,819. May 8, 1934. **Refining Metal.** William A. Cowan, Brooklyn, N. Y.

1,957,823. May 8, 1934. **Portable Polishing Machine.** Frank R. Feenan, Detroit, Mich.

1,957,837. May 8, 1934. **Method of Purifying Lead, Tin, and Lead-Tin Alloys.** Edward F. Kern, New York, N. Y.

1,957,852. May 8, 1934. **Refining White Metal Scrap.** Edmund H. Sheaff, Brooklyn, N. Y.

1,957,930. May 8, 1934. **Refining White Metal Scrap.** Gustave E. Behr, Jr., Forest Hills, N. Y.

1,957,934. May 8, 1934. **Magnesium Base Alloys.** Manley E. Brooks, Midland, Mich.

1,957,942. May 8, 1934. **Wire Coating Machine.** Wilber H. Convers, Poughkeepsie, N. Y.

1,958,199. May 8, 1934. **Die-Casting Machine.** Louis H. Morin, New York, N. Y.

1,958,323. May 1, 1934. **Manufacture of Aluminum in High Power Tanks.** Pierre Jean Michel Torchet, Riouperoux, France.

1,958,446. May 15, 1934. **Cast Metallic Denture.** Charles H. Prange, Lyndhurst, N. J.

1,958,672. May 15, 1934. **Centrifugal Casting Machine and Method.** William D. Moore and Walter Morgan, Birmingham, Ala.

1,958,730. May 15, 1934. **Spray-Gun.** Robert W. Tracy, Toledo, Ohio.

1,958,740. May 15, 1934. **Porous Metal Structure.** William G. Calkins and Anthony J. Langhammer, Detroit, Mich.

1,958,754. May 15, 1934. **Treatment of Copper and Other Metals.** Carlos E. Holley, Sudbury, Ontario, Canada.

1,959,029. May 15, 1934. **Free Cutting Alloy.** Louis W. Kempf and Walter A. Dean, Cleveland, Ohio.

1,959,087. May 15, 1934. **Metallic Foil and Method of Manufacture.** Urlyn Clifton Tainton, St. Louis, and Frank W. Harris, Clayton, Mo.

1,959,179. May 15, 1934. **Mold.** Foster Dee Snell, Brooklyn, N. Y.

1,959,297. May 15, 1934. **Method of Casting Magnesium and Alloys Thereof.** Edwin O. Barstow, Midland, Mich.

1,959,376. May 22, 1934. **Process for Producing Metal Powders.** James H. Lucas, Elmhurst, N. Y.

1,959,484. May 22, 1934. **Molding Device for Casting Machines.** Arthur D. Lund, Minneapolis, Minn.

1,959,509. May 22, 1934. **Copper Base Alloy.** Sam Tour, Englewood, N. J.

1,959,668. May 22, 1934. **Alloys.** Daniel Gray, Sherrill, N. Y.

1,959,764. May 22, 1934. **Apparatus for Plating.** Kurt T. Potthoff, Brooklyn, N. Y.

1,959,900. May 22, 1934. **Polishing Machine.** Herman M. Brown, Irving E. Estler, and Clemens J. Neuhaus, Huntington, W. Va.

1,959,913. May 22, 1934. **Magnesium Base Forging Alloy.** John A. Gann, Fred L. Reynolds and Arthur W. Winston, Midland, Mich.

1,959,925. May 22, 1934. **Method of Making Bimetallic Articles.** David Pryde, Aspinwall, Pa.

1,960,029. May 22, 1934. **Electrodeposition of Alloys.** Alexander G. Russell, Red Bank, N. J.

1,960,239. May 29, 1934. **Fluxing Composition.** Conral C. Callis and Ralph B. Derr, Oakmont, Pa.

1,960,453. May 29, 1934. **Apparatus for Bright Annealing Tubes.** Charles T. Paugh, Detroit, Mich.

1,960,483. May 29, 1934. **Method of Coating Bearings and the Like.** Charles W. Eggenweiler and William J. Fiegel, Detroit, Mich.

1,960,563. May 29, 1934. **Electrolytic Method and Apparatus.** Richard A. Wilkins, Beverly, Mass.

1,960,700. May 29, 1934. **Method of Making Magnesium Alloys.** John A. Gann and Manley E. Brooks, Midland, Mich.

1,960,711-12-13. May 29, 1934. **Method of Casting Magnesium.** Hans A. Reimers, Midland, Mich.

1,960,740. May 29, 1934. **Copper-Indium Alloy.** Daniel Gray, Onieda and William S. Murray, Utica, N. Y., assignors to Oneida Community.

1,960,838. May 29, 1934. **Process of Metal Coating or Filling.** Alvin P. Bixler, Duncannon, Pa.

1,960,895. May 29, 1934. **Process for Preparing Metal Articles.** Willis H. Castner, Cornwall, Pa.

1,960,916. May 29, 1934. **Aluminum Alloy.** Alfred John Murphy and Stanley Alfred Edward Wells, Teddington, England.

1,960,992. May 29, 1934. **Die-Casting Machine.** William J. During, Syracuse, N. Y., and Nathan Lester, Cleveland, Ohio.

1,961,030. May 29, 1934. **Process for Protecting Magnesium and Its Alloys Against Corrosion.** Guy Dunstan Bengough and Lawrence Whitby, Teddington, England.

1,961,063. May 29, 1934. **Casting Molten Material.** Paul Louis Joseph Miguet and Marcel Paul Perron, St. Julien de Maurienne, France.

1,961,065. May 29, 1934. **Method of Recovering Tin from Residues.** Thomas A. Mitchell, Denver, Colo., assignor to Lafayette M. Hughes, Denver, Colo.

1,961,096-7. May 29, 1934. **Inhibiting Process and Product.** Orin D. Cunningham, Indianapolis, Ind.

1,961,117. May 29, 1934. **Method of Welding Copper Alloys, Particularly Wrought Copper Alloys.** Matthew J. Wall, Jersey City, N. J.

1,961,148. June 5, 1934. **Machine for Copper Coating Wire.** Joseph L. Herman, Peoria, Ill.

1,961,213. June 5, 1934. **Mold-Clamping Device.** Marius Guyot, Cleveland, Ohio.

1,961,296. June 5, 1934. **Production of Lead Powder.** Lyuho S. Ishimura, Kamikyo-ku-Kyoto, Japan.

1,961,301. June 5, 1934. **Apparatus for Coating Objects with a Liquid.** Bruno Nier, Beierfeld, Germany.

1,961,304. June 5, 1934. **Method of Treatment of Friction Pieces Comprising an Exuding Substance.** Alfred Edouard Ricard, Paris, France.

1,961,621. June 5, 1934. **Induction Electric Furnace.** Edwin Fitch Northrup, Princeton, N. J.

1,961,626. June 5, 1934. **Composition of Matter.** Enrique G. Touceda, Albany, N. Y.

1,961,635. June 5, 1934. **Method of Rendering Metals or Alloys Noncorrodable.** William Herbert Hatfield, Sheffield, England.

1,961,652. June 5, 1934. **Metal Pickling Process.** Deal H. Tompkins, Vinton, Va.

1,961,656. June 5, 1934. **Rotary Core Machine.** Joseph William Athey, Birmingham, England.

1,961,667. June 5, 1934. **Method of Coating Wire.** Charles D. Johnson, Worcester, Mass.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

Equipment for Metal Manufacturing

Exhibits of Equipment and Supplies for the Metal Manufacturing Industries will be shown at the National Metals Exposition, Port Authority Building, New York, October 1-5, 1934.

Brown Instrument Company

Automatic control of hardening, tempering, annealing, drawing temperatures, etc., in the metal working industry is the central theme of the large exhibit of The Brown Instrument Company, Philadelphia, Pa., in Booth 145. Millivoltmeter types of Brown Pyrometer controllers will be shown in actual operation.

The instruments mounted on the panel board include:

Pyrometers—(Potentiometer and Millivoltmeter types)—indicating, recording and controlling temperatures in the treatment of metals.

Flow Meters—(Electrical and Mechanical types)—indicating, recording and integrating the flow of air, gas, water, oil and other liquids, etc.

Thermometers—(Indicating, Recording and Controlling)—for ranges—40 to 1200°F. In addition to the above instruments, there will be mounted on the tables the following:

A single-record recording Potentiometer in a glass case that exposes all working parts of the Brown Potentiometer which the visitor at the Booth can personally operate.

A cut-away model of the new Brown Control Thermometer will demonstrate how temperatures up to 1200°F. can be controlled without the use of relays. This new Brown Thermometer Controller operates in mercury-in-glass switches which have a capacity of 15 amperes at 110-volts, 10 amperes at 220-volts.

The Brown Thermometer control separates control functions from measuring functions. The design, it is stated, permits free and unhampered movement of the pen, thus insuring maximum accuracy.

There will also be exhibited cut-away views of the Brown Flow Meter bodies, both electrical and mechanical types. These meter bodies demonstrate clearly the operating principles on which the flow meters operate.

American Brass Company

The American Brass Company, Waterbury, Conn., will occupy space 301. The feature of the exhibit will be a series of welding demonstrations given by C. E. Swift, welding engineer. Mr. Swift will show "High Voltage" arc welding of Everdur, and oxy-acetylene welding with Tobin Bronze rods.

Display sections will show automatically welded Everdur tanks, cast iron parts repair welded with Tobin Bronze, and a full selection of Anaconda Welding Rods.

Clear Baking Primer

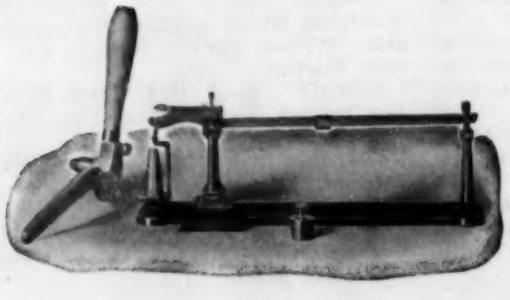
A clear baking primer that, it is stated, overcomes the adhesion problems which highly polished chromium and nickel surfaces offer manufacturing jewelers, has been specially developed and made commercially available by the Roxalin Flexible Lacquer Company of Elizabeth, N. J.

It is said that this new clear baking primer gives amazing adhesion to matt or highly polished chrome and nickel surfaces and that it is entirely free from the "seediness" so often complained of in materials of this nature. In addition it is claimed that this primer bakes at 200°F for one hour to a hard finish, flows out to a smooth surface, and takes subsequent lacquer coats perfectly.

Solder Testing Balance

The standard Richards solder testing balance is manufactured by Henry Troemner, 911 Arch Street, Philadelphia, Pa. This balance is useful for quick determinations of the percentage of tin in solder. The molten solder is poured into the mold producing a cone. This cone is placed on the pan of the scale and the reading on the beam showing the point at which the scale balances, gives the percentage of tin from 0 to 100. On the back of the beam is a scale to show the percentage of antimony in material known to be made up only of lead and antimony.

A direction sheet giving full instructions for the use of this outfit is supplied with every scale.



Richards Solder Testing Balance

Latest Products

Each month the new products or services announced by companies in the metal and finishing equipment, supply and allied lines will be given brief mention here. More extended notices may appear later on any or all of these. In the meantime, complete data can be obtained from the companies mentioned.

Improved Arc Welding Set. General Electric Company, Schenectady, N. Y. A line of portable, single-operator sets, in which self-stabilization is the outstanding feature.

Arc Welding Electrode. General Electric Company, Schenectady, N. Y. A heavily coated electrode, G-E Type W-23 for welds in the flat position.

High Speed Tapping Equipment. R. G. Haskins Company, 4636 West Fulton Street, Chicago, Ill. Range of the No. 2 machine is from No. 10 taps up to and including 7/16" in brass and other nonferrous metals.

Geared Reductions in Electric Motors, "Syncrogear Motor". U. S. Electrical Manufacturing Company, 1510 S. Western Ave., Chicago, Ill. A self-contained motor with a single base embodying a geared transmission.

Long Stroke Drawing Press. Hydraulic Press Manufacturing Company, Mt. Gilead, Ohio. A press for deep drawing parts and as stream-lined automobile lamps; equipped with synchronized-pressure die cushion.

Blowpipe Head. New welding head—Multi-Flame Linde Welding Head for use on W-17 or W-22 Oxweld blowpipes. Linde Air Products Company, 30 E. 42 Street, New York.

New Sanding Machine. A unique sanding and polishing machine, weighing 7 pounds and operating on 70 lbs. or more of air pressure. Sterling Products Company, Detroit, Mich.

Portable Grinder. Universal type with built-in air filter. Chicago Wheel & Manufacturing Company, 1101 West Monroe St., Chicago, Ill.

Metal to Glass Seal. An alloy called Fernico, General Electric Company, Schenectady, N. Y.

Foundry Flux

A new foundry flux called Cuprit has been placed on the market by Foundry Services, Inc., 107 East 41st Street, New York City. This material is recommended as a covering preparation for copper, brass, gun metal, bronzes, nickel, nickel silver and all alloys based on copper or nickel. It is said to prevent the evaporation of zinc and other volatiles and to form an impenetrable liquid film which protects the metal from detrimental gases. Among the other advantages claimed are: it gives a slag which is practically free from metal; provides a pre-determined alloy because it prevents the escape of zinc; it melts at a lower temperature than the metal; it does not attack the crucibles or furnace walls.

Quantities to be used are: ¼ to ½ per cent for copper, nickel, nickel alloys, bronzes and gun metal; ½ to ¾ per cent for brass; ½ to 1 per cent for dirty metal and turnings of copper, nickel and nickel alloys, bronzes and gun metal; 1 per cent for dirty brass or brass turnings.

Color Analyzer

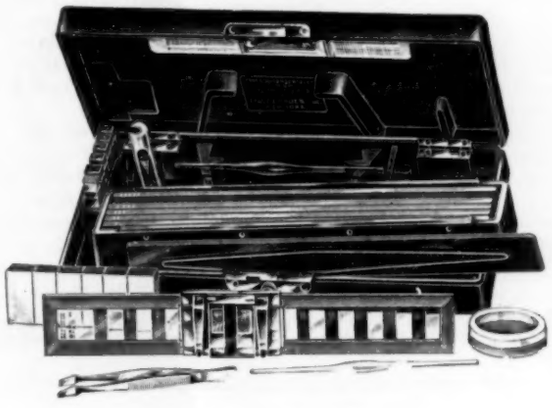
A device for analyzing color according to its psychological attributes of hue, saturation and brilliance, has been developed by the Bausch and Lomb Optical Company, Rochester, N. Y. It is designed for use with the standard Munsell color discs.

Some of the advantages planned for this color analyzer are much lower cost than that of a good Spectrophotometer; rapidity of operation; sturdiness and long life.

The Wulff pH Tester. Indicator Strip Method

In the usual method of testing for the pH (active acidity) of plating baths, a liquid indicator which changes color is added to the solution and the color change is matched with standards. In most plating solutions there is a color already present, and often turbidity and suspended matter, which tend to make the reading of the indicator change very difficult. The Wulff pH Tester, Indicator Strip Method is said to do away with these difficulties by the use of a water diffusible cellulose membrane impregnated with the indicator. The strip is placed in contact with an unmeasured amount of the plating solution for one minute, blotted to remove adhering matter, and the true indicator color is matched directly with standards made of the same material. Thus it is claimed, a pH reading can be obtained with ease and a minimum of operations.

The Tester is supplied in a small, compact, durable Bakelite case neatly fitted so that it can be conveniently used for field and plant work. The method requires no liquids or measuring operations and is therefore easily used by workmen or assistants having no technical training.



Wulff pH Testing Set

Literature will be furnished on request by Pfaltz & Bauer, Inc., 300 Pearl Street, New York, N. Y.

Catalogs

Kramer Alloy News. A house organ published by H. Kramer and Company, Chicago, Ill. (207)

My Trip Through the AC Factories. A description of the various departments of the AC Spark Plug Company, Flint, Mich. (208)

Continuous Controlled Atmosphere Furnaces. Conveyor belt type furnaces with conditioned atmosphere suitable for annealing, silver soldering, copper brazing and scaleless hardening; electric and fuel-fired. W. S. Rockwell Company, 50 Church Street, New York. (209)

Design for Profit. A booklet on the design of metal products for service and saleability. N. J. Zinc Company, 160 Front Street, New York. (210)

Pressure Recording Instruments. A description of a variety of types in Bulletin No. 834. Esterline-Angus Company, Indianapolis, Ind. (211)

Bearing Bronze in Bar Form. Standard 6′ lengths of Permite, leaded phosphor bronze bars. Aluminum Industries, Inc., Cincinnati, Ohio. (212)

Chemical Price List. For platers and metal novelty manufacturers. Charles Cooper and Company, 194 Worth Street, New York City. (213)

Motor-Generator Plating Sets. Bulletin No. 91. A description of a variety of such sets made by the Electric Products Company, Cincinnati, Ohio. (214)

Machines, Tools and Work Benches. For the dental laboratory, light metal and novelty manufacturing industries. Leiman Bros. Inc., Newark, N. J. New York address 23 Walker Street. (215)

An Outline of Service to Industry. A description of the researches conducted for industry on a non-profit basis. Battelle Memorial Institute, Columbus, Ohio. (216)

Relief Valves. For industrial use. Tuthill Pump Company, 131 W. 63rd Street, Chicago, Ill. (217)

Motor Reducers. Bulletin No. 272. The Falk Corp., Milwaukee, Wisc. (218)

Stain-Ox Rouge Compound for Varnishing, Glazing and Revivifying Finishes on Automobiles; for chromium, nickel, brass, copper, etc. Stain-Ox Company, Roselle, N. J. (219)

Save time. Use the coupon below to get any of the above catalogs or bulletins, or for data on any subject not mentioned this month. METAL INDUSTRY will see that you get them promptly.

METAL INDUSTRY
116 John Street, New York.

(Insert below the number in parentheses at end of each item desired.)

I wish to receive the following bulletins mentioned in October .....

.....

I want information on the following equipment or materials also: .....

.....

Associations and Societies

New York Branch, A. E. S.

A regular meeting was held on August 24, and considering the inclement weather it was well attended.

Secretary Frank MacStoker read Charles Proctor's regular letter which was very interesting. Since the departure of Mr. Proctor with his family, he has never failed to send a letter for each meeting describing his travels.

Another welcome letter was received from Arthur Grinham of Newcastle, Australia. Though thousands of miles away, Mr. Grinham has kept in frequent communication with his friends and brother members in New York Branch.

Our September 14 meeting was devoted almost entirely to Good and Welfare. An interesting and enlightening discussion was had on the exposure tests and specifications for non-ferrous metals being conducted by the Bureau of Standards.

Discussions were held on nickel solutions for zinc die cast work, which brought out many interesting experiences.

Meeting was adjourned at 10:45 P. M.

Arthur Wallace
Rec. Sec.

Newark Branch, A.E.S.

The Newark Branch held its annual Clambake at Vogel's Grove, Springfield, N. J., on Saturday, September 29th. In spite of the intermittent rain, well over 100 attended the affair, (including a number of the gentle sex) and had a glorious time, with plenty of food, meetings with old friends and entertainment.

Connecticut Non-Ferrous Foundrymen

The September meeting of this association was held at the New Haven Yacht Club, New Haven, Sept. 11th, presided over by Chairman David Tamor of the Reading, Pratt & Cady Company, Hartford.

The feature of the meeting was a Round Table Discussion led by Mr. Tamor which covered alloys of electrical conductivity and treatment of ladles and crucibles used for pouring purposes only.

The next meeting will be held at New Haven Yacht Club on October 9th with dinner at 7 P. M. and we are going to get some of the A. F. A. Non-Ferrous Pre-prints will be discussed in a Round Table Session.

Personals

J. E. Archer has been added to the staff of Battelle Memorial Institute of industrial and scientific research, Columbus, Ohio. Mr. Archer is a graduate in chemistry from Michigan State College, and for the past four years has been associated with Professor Colin G. Fink of Columbia University, New York. He will devote himself to electrodeposition problems.

A. D. Walter has become associated with the Peerless Electric Company, Warren, Ohio, and will maintain his headquarters at the Warren office.

Charles H. Proctor has returned to the United States after a trip around the world of several months duration.

H. A. H. Pray has been appointed an assistant physical chemist in Battelle Memorial Institute, Columbus, Ohio.

During 1926-1933 Dr. Pray was professor of chemistry in West Virginia University. He is the author of five papers on physico-chemical problems.

Obituaries

H. E. Willmore

H. E. Willmore, one of the organizers of the Crown Rheostat and Supply Company, Chicago, Ill., and secretary of that company until April 1932, passed away at his home in Oak Park, Ill., on September 7th.

Mr. Willmore was born in England in 1862, and would have been 72 years old on September 29th. His many friends in the electroplating industry will always remember him as Ed Willmore, somewhat diminutive in stature, but forceful and aggressive in his undertakings. He had a commanding personality; he was witty even fiery at times. His associates took it for granted that he had a complete education, few if any of them knowing that it had ended when he was only nine years old.

His real education consisted of almost constant reading and study. His philosophy was that one should strive to be the best in his own chosen work. He was generally considered to be probably the best practical plater in the country, and there are few plating shops that do not have his "Formulary" for reference as it was incorporated and copied freely in many plating supply house catalogs.

H. E. Willmore

Mr. Willmore was one of the founders of the American Electroplaters' Society and the first Editor of The Monthly Review. For many years the issues of The Monthly Review carried a quotation on the inside front cover placed there by its first editor and no finer tribute can be paid him than to repeat it here.

"I expect to pass through this world but once. If there is any good therefore, that I can do or any kindness that I can show to any fellow man, let me do it now. Let me not defer or neglect it, for I shall not pass this way again."

Mr. Willmore, although born in England, had completely adopted the United States as his own country and strongly objected to being considered anything but an American.

William Fray

William Fray died July 22, 1934 in Bridgeport, Conn., in his 69th year following an illness of several months. Mr. Fray was well known in the brass and copper industry in which he spent most of his life.

William Fray

He was born in 1865 in the County of Cornwall, England and was the son of the late Samuel and Emma Sweet Fray. He came to Bridgeport with his parents when he was two years old and received his primary education in the Bridgeport schools after which he learned the machinist trade at the old Pacific Iron Works. Later he worked for the Bullard Machine Company in Bridgeport. He took a course in mechanical engineering at the International Correspondence School. He then went to Waterbury as a Foreman for the Waterbury Farrel Foundry & Machine Company, where he had charge of building machines, many of which were used in the brass industry. After working there for several years, he accepted a position as Superintendent of the Wire Mills of the Benedict & Burnham Mfg. Company and remained with this Company until after its merger with the American Brass Company. He later returned to Bridgeport to act as Superintendent of the Fray Manufacturing Company. In the meantime, the Standard Brass & Copper Tube Company had been formed in New London by Charles Morse, General Manager of the Benedict & Burnham Plant of the American Brass Company, and Fred Loomis, who was formerly Chief Engineer of this Company and later Engineer for the National Cable & Conduit Company of Hastings, N. Y. Associated with these men were several prominent Waterbury men. In expanding the activities of

this Plant, Mr. Fray was sent for and became Superintendent, later Vice-President and finally President of the Company. He retained the latter position during the War and negotiated the sale of this Company to the Bridgeport Brass Company. Shortly thereafter he retired from active business and devoted part of his time to travel and the rest to the development and perfecting of special tube mill machinery. He was a recognized authority on piercing mill design for the non-ferrous industry.

Mr. Fray was a member of the American Society of Mechanical Engineers and acted as Treasurer of the Bridgeport Section for several years. He was a Mason and belonged to two Lodges of the Odd Fellows in Waterbury.

He is survived by his widow, Mrs. Minnie J. Fray, a daughter, Mrs. Florence Clark and a son, George H. Fray, who is Superintendent of the Power Plants of the Bridgeport Brass Company. He is also survived by two brothers and two sisters.

Mr. Fray had many friends in the industry and was liked and respected by all who came in contact with him.

Ludwig Vogelstein

Ludwig Vogelstein, chairman of the board of the American Metal Company, Ltd., died September 22nd at Mt. Sinai Hospital, New York, after a short illness. He was 63 years old.

Mr. Vogelstein's chief interests in metallurgy and mining were in copper, silver and nickel. Considered an authority on matters concerning the metal industry, he had served on many boards and committees in connection with the business.

Mr. Vogelstein was a leader in philanthropic activities, and an important figure in social life. He was a bachelor and is survived by two brothers, one in London, one in Breslau, Germany and a sister in Berlin.

Frederick H. Miller

Frederick H. Miller died August 15, aged 78 years. He was born in Milwaukee and in 1887, with W. A. Lamp, founded the Lamp and Miller Manufacturing Company, brass foundry, being active in the business until he retired four months ago because of illness.

Louis Haack

Louis Haack, formerly head of the Gramercy Brass and Iron Works and past master of Henry Clay Lodge, F. and A. M., died recently at his home 1391 Beach 28th Street, Far Rockaway, N. Y., following a heart attack. He was 69 years old. His widow, Dora Haack, and two sisters and a brother survive.

Franklin D. Williams

Franklin D. Williams, one of the owners of the Bay State Crucible Company and a director of the New England Brass Foundry, died at his home in Taunton, Mass, on September 6th. He was born in Taunton, December 21, 1861.

Industrial and Financial News

News of the Codes in the Metal Industry

COPPER

At a meeting of the Executive Committee of the Code Authority of the nonferrous scrap metal trades at The Times Building, New York, on September 6th, a conference was held with **H. O. King,** Managing Director of the Copper Code Authority, to settle the difficulties between scrap metal dealers and the copper smelters, with special reference to the manner in which custom smelters are buying their scrap, what proportion they pay for at Blue Eagle prices and what proportion at the non-Blue Eagle or export prices. The question is still under consideration.

Copper, Brass and Bronze Trade

The Supplementary Code of Fair Competition for the Copper, Brass, Bronze and Related Alloys Trade (a division of the Wholesaling or Distributing Trade) was approved August 13th and went into effect August 23rd. Labor provisions set a maximum work week of 40 hours and a minimum wage of $15.00 per week, with 40 cents per hour for part time workers.

Some of the outstanding trade practice provisions include: no protection against price decline; merchandise returned for credit must include a charge for handling; purchases of scrap can be made only on current metal schedules; no consignment shipments except under unusual conditions; no quantity discounts or extras on any other basis than that of the quantities shipped to a single buyer; all schedules of prices, rebates, discounts, etc., must be filed with the Divisional Code Authority; in emergencies, minimum prices may be set for specified products.

SILVERWARE MANUFACTURING

The silverware manufacturing industry has drawn up a set of standards of quality for various grades of the products of this industry, which have been approved by the Administrator. Details of these standards will be found on page 340 of this issue.

The industry has also set up a cost accounting system which has been approved. Details can be obtained from Alexander Vincent, Executive Secretary, 20 W. 47 street, New York.

BRASSES AND JOURNALS

The Code Authority for this industry has been approved and consists of the following members:

W. H. Croft, president Magnus Company, Inc., Chicago; **J. B. Strauch,** president National Bearings and Metals Corporation, St. Louis; **C. W. Beugger,** comptroller, National Bearings and Metals Corporation, St. Louis; **B. I. Kaufmann,** president Edna Brass Manufacturing Company, Cincinnati, and **F. A. Croft,** vice president, Magnus Company, Inc., Chicago.

NICKEL INDUSTRY

The Code Authority has been approved for this industry consisting of the following members:

J. F. Thompson, vice president of International Nickel Company, chairman; **F. L. Driver,** president of Driver-Harris Company, Harrison, N. J., vice chairman. Other members are: **A. L. Marsh,** president of Hoskins Manufacturing Company, Detroit; **W. D. Little,** vice president of that company; **P. D. Merica,** assistant to the president of International Nickel Company, and **F. Lindsay,** vice president, Driver-Harris Company. **H. G. Fales** is executive secretary of the Code Authority which has its headquarters at 67 Wall Street, New York City.

ALUMINUM

W. A. Hastings of the Aluminum Products Company, La Grange, Ill., has been appointed to the Aluminum Code Authority, to represent concerns not members of the Association.

Formal protest has been filed with General Johnson by the **Independent Aluminum Fabricators Group** against limiting them to a single representative on the industry's code authority. They ask for modification of the Aluminum Code to give the independents 7 representatives instead of one out of a total of twelve. The protest was signed by the **Bausch Machine Tool Company,** Springfield, Mass., **Aluminum Products Company,** LaGrange, Ill., and the **Sheet Aluminum Corporation,** Jackson, Mich.

The **Aluminum Forgings Industry,** a division of the Aluminum Industry has filed a proposed Supplemental Code under the basic code of the Association of Manufacturers in the Aluminum Industry. Labor provisions are accepted as in the Basic Code. Trade practices are listed, some of the important ones being: prohibiting contracts with buyers without obligation on their part to take delivery of the quantities specified, for the purpose of giving special unwarranted prices; prohibiting requirement contracts without the specific minimum of 75 per cent of the maximum and without a time limit of six months; pro-

hibiting cancellation of contracts without consideration for expenses incurred; prohibiting protection of customer against price decline; prohibiting waiving the cost of original dies and special tools; prohibiting accepting forging dies and other special equipment made by another forging manufacturer in this division

A public hearing was held on September 24, 1934. Details will be published in full as soon as available.

Metal Developments

According to a news item in the daily press reviewing the book **"Romantic Copper; Its Lure and Its Lore"** by **I. B. Joralemon,** the copper age began in the Island of Cypress many years ago, when the half savage inhabitants found some heavy red stones which could be hammered into desired shapes without breaking.

The **Western Clock Company,** La Salle, Ill., now has the distinction of being the safest industrial plant in the United States. On August 20, this organization broke the existing record of the Old Hickory plant of the Dupont Company of 9,166,634 man hours work without a disabling injury, and on September 1st, the record was still unbroken.

Dr. C. G. Fin: of Columbia University recently stated that the day has already come for students in technical schools to specialize in solar engineering, the conversion of the sun's radiation into mechanical energy. How solar energy can be put to work cannot be answered at this time, but it is safe to say that when, as and if it is accomplished, metals will have to be used in the process.

A **United States Army first-aid packet, a brass shell,** issued to a member of the A.E.F. in 1918 and lost at sea, has come to rest after sixteen years of cruising. According to a communication from Bauer and Black, Chicago, Ill., who recognized this packet as of their own manufacture, this packet consisting of sterile gauze compresses sealed in a shell stamped from 30 gauge sheet brass. It was found on the shore of St. Agnes, a small island off the coast of England near Land's End, with the contents in prefect condition.

Revere Day was celebrated at the Century of Progress Exposition in Chicago, Tuesday, September 11th, with an elaborate program. An important part of this program was the reference to Revere's prominence in copper rolling and manufacturing.

A news item in the technical press states that a **special galvanized wire** recently brought out by one of our leading steel companies, is zinc coated by electrodeposition instead of hot dpping. The zinc in the ore is leached and the zinc deposited from the resulting solution as a highly adherent coat, which will not crack off or chip off during the bending of the wire. Emphasis is also placed on the possibility of depositon to any depths of zinc required.

The **British Import Duties Advisory Committee** has received an application for placing on their free list, alloys, unwrought in blocks, ingots, cakes, bars and slabs, containing more than 20 per cent by weight of tin.

The **Apollo Metal Works,** La Salle, Ill., will exhibit the first gasoline pump ever equipped with a pre-finished chrome casing at the Second Industrial Materials Show, to be held at the Park Central Hotel, New York, during the week of October 15th.

Large brass and bronze cylinders are now being successfully cast by the centrifugal process in the brass foundries of one of the large steel companies. According to published reports, cylinders have been made up to 288" in length and up to 48" in outside diameter.

Investigation is now going on into the **coating of steel with aluminum** to replace tin plate. Two processes are said to be under consideration. One is electrolytic and the other, hot dip.

A new type of electric induction melting furnace is said to have appeared in Germany and Sweden, using low frequency current for melting down and high frequency for finishing the heat.

Aluminum in star shaped pieces is being recommended for addition to steel for deoxidizing purposes because of the larger area exposed and the ease of fixing such pieces to stirring rods.

A report states that a Detroit company has developed a **rust-proofing machine** for the treatment of small various shaped pieces. It is stated also that this machine can be attached to the equipment which cleans the metal before rust-proofing. The handling of the work is largely automatic.

Powder metallurgy is still going ahead. It is now, according to press reports, being used for large bronze locomotive bearings for solid rods which, after proper heat treatment, can be drawn down into wire; also for an alloy of the stainless iron class consisting of 18% chromium, 8% nickel, 3.5 molybdenum.

One of the projects of the **National Physical Laboratory** in England is a **non-tarnishing silver.** British patent No. 399,261 describes alloys of silver with small additions of beryllium, which it is stated, possess a high tarnish resistance to sulphur compounds.

Completion of plans for the holding of a **four-day welding clinic** in New Orleans, La., at the Isaac Delgado Trade School starting October 24 has just been announced by the Linde Air Products Company, New York, distributor of materials and equipment for oxy-acetylene welding and cutting. The purpose of this type of general clinic is to pass on to those interested in oxy-acetylene welding and cutting information on new developments in the industry; to assist those who have welding and cutting problems; to demonstrate and give instruction on new and old applications of the oxy-acetylene process; to afford a chance for discussion.

Indium plated reflectors were put into use in a store window in Utica, recently. This new metal has been made available for commercial purposes by the Indium Corporation of America, Utica, N. Y., of which W. S. Murray is president. It is claimed that indium reflects a very pleasing, brilliant light and reflects a wide range of colors in the spectrum.

Aluminum Strike Settled

After about a month of idleness, 8,000 workers of the Aluminum Company of America returned to work on September 6th, under an agreement with the company. Some of the provisions are as follows:

1. The company "recognizes and accepts the principles of collective bargaining" as provided in the National Industrial Recovery Act.
2. The "closed shop" is not involved.
3. No reduction in the wage scale of Aug. 9, 1934, is contemplated.
4. There shall be no discrimination against any employee because of membership or non-membership in a labor organization or any other organization.
5. Employees who feel that they have a grievance may carry their case to the highest company officials, personally or through representatives. If satisfaction is not obtained, and "if agreed upon by both parties," the case may be submitted to the National Labor Relations Board for arbitration.

Metal Finishing Lawsuit

In a civil suit brought by the Ault & Wiborg Corporation, 75 Varick Street, New York, against the Oxford Varnish Company, in connection with their license agreement on their graining plates under the provisions of Sec. 16 of the Clayton Act, charging that the patent licenses issued by the Oxford Company are in violation of Sec. 1 and 2 of the Sherman Law and Sec. 3 of the Clayton Act, U. S. Judge Reeves, sitting as District Judge in the Federal Court at Detroit, recently handed down an opinion and issued a decree in favor of plaintiff and enjoining defendant from granting patent licenses containing conditions which tended to restrain competition in varnishes, enamels, etc.

Verbatim copies of the Court's opinion can be obtained from the Ault & Wiborg Corporation.

Radio Electrical Show

The Radio-Electrical Exposition was held in New York in the latter part of September at Madison Square Garden.

As usual, non-ferrous metal parts and plated surfaces were widely in evidence. The exhibitors consisted entirely of firms manufacturing and distributing these devices to the consumer; in other words, they represented the market for metals and plating work.

The lines covered were as follows:

Radios	Food mixers
Phonographs	Waffle irons
Refrigerators	Kitchen stoves
Vacuum cleaners	Dish washers
Toasters	Juicers
Irons	Floor waxers
Fans	Electric heaters
Coffee percolators	Clocks
Washing machines	Sewing machines
Ironing machines	Ford Automobiles

Oil Burning furnaces
Automatic telephones

Moving picture cameras and projectors
Air conditioning units (coolers and humidifiers)

A very interesting exhibit was that of the Federal Housing Administration featuring a better housing campaign.

Business Items - Verified

Anaconda Copper Company reports earnings for the first six months of 1934 of $2,986,497, against a loss for the whole of 1933 of $6,822,115.

Revere Copper and Brass. Inc., has opened an office at 922-3 Grand Rapids Bank Building, Grand Rapids, Mich. David T. Applebee is District Manager.

American Smelting and Refining Company reports profits for the first six months of 1934 at $4,263,577.06 against $2,030,209.03 for the same period in 1933.

American Brass Company opened an office in Syracuse, N. Y., which is located in the State Tower Building. **C. M. Saltsman** who was formerly connected with the main office in Waterbury, will be in charge of the new Syracuse office.

Revere Copper and Brass, Inc., 230 Park Avenue, New York, has let general contract for a one-story addition to its Rome Division tube mill, Rome, New York, approximately 35,000 square feet.

Seth Thomas Clock Company is erecting a new case shop in Thomaston, Conn. The new structure will adjoin the main building and will measure 80 ft. wide and 380 ft. long. It is expected to cost $100,000 and to be ready for occupancy by January 1st, 1935. The estimate also includes equipment and machinery. The following departments are operated: brass, bronze and aluminum foundry; tool room, casting shop, stamping, soldering, plating, polishing, grinding room, lacquering and japanning.

Metals and Alloys, Ltd., 1 Wiltshire Avenue, Toronto, Canada, has been organized, and has leased part of the local plant of Toronto Metal Foundries, Ltd., which is equipped for the production of metal and metal alloy products. S. R. Francis is manager of the company. The following departments are operated: smelting and refining, brass, bronze and aluminum foundry; casting shop.

W. M. Lester has opened an office at 278 Rockefeller Building, Cleveland, Ohio, for sales of die casting machinery manufactured by the **Lester Engineering Company**, Cleveland, of which he is president, and for engineering service in the die casting field.

Batliloi & Company, Forbes Street, Fort Bombay, India, is inquiring for catalogues containing information relative to rouges, compositions, plating supplies and equipment of all kinds.

Tube Turns, Inc., has removed its New York office from 30 Church Street to 110 East 42nd Street. M. P. Curley, district manager will continue in charge of the New York office, and will be assisted by I. P. Pfeil.

The Bunting Brass Company, Toledo, Ohio, has recently placed a contract for a complete fume-recovery system for its blast furnaces with The Northern Blower Company, dust and fume recovery engineers, West 65th Street and Barberton Avenue, Cleveland, O. The installation is expected to be in operation within the next few weeks.

New Incorporations

Consolidated Parts Corporation, 6225 South Cottage Grove Avenue, Chicago, Ill., has been organized to manufacture automobile and mechanical parts and equipment by Lawrence Cohn and I. D. Ponicke. The following departments will be operated: aluminum foundry, casting shop, stamping, grinding room.

Safe-Dee-Fender Corporation, Springfield, Mass., has been organized by Edward G. Leffler and A. W. Smith, A. A. Roth and George W. Hobbs, to manufacture the safety fender.

News From Metal Industry Correspondents

New England States

Waterbury, Connecticut

Oct. 1, 1934.

The expected fall pick up in local brass industries has not materialized. While there was a slight and continual falling off in business from the middle of June through August, the recession was no more than the usual seasonal decline. It was believed that there would be a gradual upturn beginning after Labor Day but while it has not occurred there has been no additional recession.

James R. Sheldon, who was receiver for the **Beardsley & Wolcott Manufacturing Company**, while it was under the state courts, last month asked the superior court for permission to take an appeal to the U. S. district court of appeals to test the validity of the new federal bankruptcy act permitting reorganization of firms. It was under this act that some of the creditors, three months ago, by appealing to the federal court, blocked the sale of the concern to the **Waterbury Buckle Company** for about $106,000 as ordered by the state court. The federal court, after halting the sale, appointed three trustees, headed by **Lyle Brown**, a creditor, to handle the business and ordered **Mr. Sheldon** to turn over his authority to them.

After two hearings, **Judge J. R. Booth** of the superior court refused to grant the permission.

Waterbury police are attempting to link extensive thefts of copper and brass from local concerns with the arrest in Bristol last month of six Waterbury men who were arrested while loading a truck with a ton of scrap metal from the **Veeder-Root Company** plant. It has just been revealed that during the past year, the **American Brass Company, Chase Company**, New Haven railroad and other smaller concerns have lost 10 tons of brass, copper and nickel, apparently stolen. One of those arrested admitted having stolen about $150 worth of metal from the **Chase Companys.**

—W. R. B.

Connecticut Notes

Oct. 1, 1934.

BRIDGEPORT—The **American Chain Company, Inc.**, reports net profits of $244,500 for the first six months of this year compared with a loss of $656,753 for the corresponding period last year. Earnings per share on the 7 per cent preferred stock are equivalent to $2.56.

The **Bullard Company** reports a profit of $207,065 for the first six months of this year compared with a net loss of $236,122 for the same period last year. Current assets June .30 were $693,059 including $120,851 cash. Current liabilities were $54,775, making working capital $638,284 compared with $465,152 on Dec. 31, 1933.

HARTFORD—All directors and officers of the **Billings & Spencer Company** were reelected at the annual meeting last month.

NEW BRITAIN—**Stanley Rule & Level Company** is producing a new tool

called the "Stanley Fibre Board Cutter." It somewhat resembles a plane but has a number of tools in it adaptable for special needs, such as bevelling the edge of a fibre board, grooving, cutting off, leaving both edges square and clean so joinings can be made without the edges being discernible. Ornamental work can be cut as the tool combines slitting, bevelling and grooving attachments.

TORRINGTON — Torrington Company directors have declared a dividend of $1 a share payable Oct. 1 to stockholders of record Sept. 14. Previously 75 cents was paid. Net profits after reserve for taxes for the year ending June 30 were $2,231,488 compared with $1,260,994 for the previous year. Net earnings represent about $5.98 a share. Dividends of $2.75 per share were paid during the year compared with $2.50 a share the previous year. The surplus June 30 was $3,633,099 compared with $2,984,196 the previous year. Current assets, including $5,719,139 in cash and government securities amount to $8,270,466 and current liabilities to $665,111. All directors and officers were reelected last month.

BRISTOL—Frank C. Wilcox, 71, of 146 Maple street, former superintendent of the **New Departure Manufacturing Company** died Aug. 31 following a six weeks illness. He was born in Cromwell, Conn. and was with the New Departure Company 37 years, retiring five years ago. He leaves a son **Charles F. Wilcox,** a daughter, **Mrs. Grace W. Bunnell** and a sister, **Mrs. Hattie M. Hubbard.**

THOMASTON—The **Seth Thomas Clock Company** is erecting a mill construction factory, 80 by 380 feet, to be used for a case shop, replacing a wooden structure used for 100 years. It is now experiencing a seasonal pick up in business. It is changing its clock styles, featuring modernistic patterns in tune with current interior decorating.

WINSTED—Judge Carroll C. Hincks of the United States District court has issued a decree permitting termination of the receivership of the **W. L. Gilbert Clock Company** of this city. A loan of $125,000 from the Reconstruction Finance Corp. has been negotiated provided $50,000 worth of notes are taken elsewhere. Stockholders have already subscribed for $15,000 worth of the notes and acquired company stock held by a Boston bank. The Winsted Recovery Committee is increasing its capital by subscriptions so that $35,000 of the remaining notes may be taken up. Larger creditors will receive 75 cents on a dollar and claims of less than $500 will be paid in full.

NEW LONDON—The **Electric Boat Corporation** has started work in its drafting department under the contract to build three new submarines for the United States Navy. Employees will be added as the materials arrive. The present working force numbers 1,300. The submarines are of 1,300 tons each, about the size of the Cuttlefish, recently finished and the contract amounts to $7,161,000—W. R. B.

Providence, R. I.

October 1, 1934.

Recently a successful bidder before the United States Navy's Bureau of Supplies and Accounts, the **United Wire & Supply Corporation,** 1497 Elmwood avenue, Cranston, has been awarded an order of $13,763 for brass and copper tubing. The order is one of the largest of its kind placed by the navy department in several months. The bulk of the order will be seamless copper tubing, in lengths of not less than twelve feet and varying in diameter from less than two inches to more than eight inches, to be delivered at the navy yards and supply depots on the West Coast within forty days. Small lots of brass voice tubing, included in the order, will be sent to the navy yards in Brooklyn, N. Y., and Norfolk, Va.

Handy & Harman Company, gold and silver refiners of New York and Bridgeport, Conn., with a branch in Providence has given a general contract for the construction of two two-story plant units on Glasmere avenue, in Fairfield, Conn. The cost of the new buildings, with equipment, is estimated at $20,000.

The first meeting after the summer recess of the **Metal Findings Manufacturers' Association** was held at the Narragansett Hotel on Wednesday, September 5 with President **Frederick A. Ballou, Jr.,** conducting the business session. **Robert Knox** of the Manufacturing Jewelers' Board of Trade, was the speaker.

As a result of conferences between a number of manufacturing jewelers of Attleboro, **Edwin O. Otis, Jr.,** secretary of the **New England Manufacturing Jewelers' and Silversmiths' Association,** and **Arthur L. Hazlett,** secretary of the **Attleboro Young Men's Christian Association,** a school for the instruction of unemployed young men and boys in the practical and technical details of the jewelry and silverware manufacture is being opened at the rooms of the Attleboro Y. M. C. A. with competent teachers to give instructions at six-hour sessions held on stated days each week. Efforts will be made to find employment for attendants at the school as they become proficient.

Jonas Goldenberg, of 177 Morris avenue has filed a statement of ownership of the **Goldenberg Manufacturing Company,** 117 Point street.

Belcher & Loomis Company has given up its branch retail store at 135 Weybosset street.

The **Star Novelty Company, Inc.,** of Providence, has been incorporated under the laws of Rhode Island with an authorized capital consisting of $7000 common stock divided into 140 shares of $50 each and $8000 preferred divided into 80 shares of $100 each. The incorporators are: **Joseph Pazullo** and **Michael Pazullo** of Johnston, R. I., and **Pasquale J. Valerio** of Cranston, R. I.

The bronze bust of **John Adams,** the second President of the United States that was unveiled at Fort Adams, Newport, on August 21, was cast in the bronze foundry of the **Gorham Company,** Providence. It was designed by **Gerald B. Dennison.**

Warwick Brass Machine Company, Inc., of Warwick, has been incorporated to manufacture brass and iron unions with a capital of 100 shares common, no par value. The incorporators are: **Roy T. Morgan** of Lincoln Park, **C. M. Morey** of Norwood and **Patrick T. McCarroll** of Providence.

A certificate of business incorporation has been issued to **John R. White** of Providence, **Byron U. Richards, Jr.,** of Pawtucket and **Charles F. Miller** of Cranston to conduct a foundry and machine shop at Woonsocket, under the name of the **Fairmount Foundry Company,** with a capital of $50,000 divided into 500 shares of common stock.

John A. Smyth, president and treasurer of **MacMillan & Company,** manufacturers of jewelers' findings, at 9 Calender street, Providence, died Aug. 31 at his home in that city. He was fifty years of age, a native of New York State but came to Providence about 25 years ago and for the past ten years had been associated with **MacMillan & Company.**

Brier Manufacturing Company, manufacturing jewelers, 222 Richmond street, has filed notice at the office of the Secretary of State of an increase in capital from $20,000 to $200,000.

Elena Tortolani, 507 Broadway has filed with the City Clerk's office a statement of ownership of **The Mayflower Jewelry Company,** 185 Eddy street.

Fire caused by an overheated enameling oven at the jewelry enameling plant of **T. R. Lewis, Jr.,** 19 Calender street on September 3, resulted in several hundred dollars damage.

Upon the petition of **Ernest L. Davis** the Superior Court of Providence County has appointed **Bernard Abel** as receiver for **The Jewelry Corporation.**

The name of the **Fairmount Foundry & Engineering Works** at Woonsocket has been changed to the **Woonsocket Foundry Company.**

The Stanton Enameling Company, 19 Calender street, Providence, is owned by **S. Harry Gill** of 47 Chestnut street, according to his statement.

W. H. M.

Middle Atlantic States

Newark, New Jersey

October 1, 1934.

Bendix Aviation Corporation, 545 North Arlington Avenue, East Orange, has plans drawn for a manufacturing building, and administration building on the Raymond Boulevard here to cost $300,000. **Merck & Company,** Rahway, has let a contract for an addition to its chemical works to cost $30,000. **Raritan Copper Works,** Perth Amboy, will erect a metal treatment plant addition to cost $30,000.

Wehlman Sign Company, 177 Central

Avenue, Newark, has leased a building for the manufacture of electric neon signs. **Wholesale Equipment Company,** of New York, has leased a building on Central Avenue, Newark.

Following Newark concerns have been incorporated; **Perkin Chemical Company Inc.,** 200 shares no par; **Western Wire Forming Company,** wire, 2,500 shares. —C. A. L.

Trenton, New Jersey

October 1, 1934.

Six mining concerns have been ordered by Vice Chancellor Stein to show cause why they should not be required to answer questionnaires sent to them by the attorney general and why they should not be restrained from selling securities in or from New Jersey until they comply. The defendant concerns are; **Base Metals Mining Company, Ltd.,** a Canadian concern; **Empress Gold Mining Company, Ltd.; Sudbury Basin Mines, Ltd.; McKinley Mines Security Company, Ltd., of Ontario; Consolidated Virginia Mining Company, of Nevada,** and the **United Gold Mines,** a Colorado concern. The **General Mining Corporation,** and **McVittie-Graham Mines, Ltd.,** were ordered by Vice Chancellor Buchanan to answer questions of the attorney general and restrained them from selling stock pending compliance.

Following concerns have been chartered here; **A. L. Wilson Chemical Company,** Jersey City, $17,500; **Velart Corporation,** chemicals, Paterson, $20,000 preferred, $100,000 common; **Pullman Chemical Company,** Camden, 250 shares; **Peerless Color & Chemical Company,** Jersey City $5,000; **United Appliances Corporation,** Hoboken, $100,000. —C. A. L.

Middle Western States

Detroit, Michigan

October 1, 1934.

Manufacturing of every nature fell off to a low point during the last few weeks. Much was expected immediately following Labor Day, but thus far no market change has been recorded.

Production in every line of non-ferrous metals is dragging. Although considerable uncertainty is expressed, it is, however, overshadowed by abundance of optimism that promises well as the season advances.

The disappointing phase just now is the weakness in the motor car industry. With one or two exceptions, most of the big plants are temporarily idling.

Manufacturers of automobile accessories are following the trend of the key industry and are likewise on low production schedules.

The most active plants are those manufacturing refrigeration units. Production in this line has been sustained for months, with little, if any, interruption, and promises to continue to well along into the winter.

Reports from manufacturers of plumbing and steam fitting supplies are not very encouraging. Production, while increasing spasmodically, does not seem to hold up, and is now at a low point.

The plating plants are more or less quiet, but this is believed only a temporary condition.

Acquisition of the **Detroit Vapor Stove Company** by the **Borg-Warner Corporation,** was announced recently by **Howard E. Blood,** vice president of the Borg-Warner organization. The stove company will continue to operate independently, its management, organization and distribution methods remaining unchanged.

Electric Auto-Lite Company and its subsidiary have been awarded a long-term contract covering ignition, lighting and starting equipment for all cars manufactured by the **Chrysler Corporation,** according to an announcement by **R. G. Martin,** president of Auto-Lite. The contract covers electrical equipment, for all Plymouth, Dodge, DeSoto and Chrysler passenger cars as well as for all Dodge trucks, and will become effective on Chrysler's 1935 production requirements.

Officials of the **Briggs Manufacturing Company,** producers of bodies and metal specialties here announce a plant expansion to cost between $500,000 and $1,000,000, making the second undertaking of the kind within a year. The plumbing division will be removed entirely from the Mack avenue plant to the old Hamtramck plant which has been idle since 1929, it is stated.

Removal of the entire bumper manufacturing division of the **Eaton Manufacturing Company** from Cleveland to Jackson, Mich., has been announced by **J. O. Eaton,** chairman of the board of directors. The new program calls for concentration of all such operations in Jackson with greatly increased production in view. Officials indicated that labor conditions and taxes made it impossible to operate the Cleveland plant at a profit and it is to be closed permanently.

The **National Parts Company, Inc.,** is a new concern at 904 East Sheridan avenue, Lansing, Mich. The principal owner is **Albert K. Steigerwalt.** This concern is engaged in a general manufacturing business.

The **Sparta Foundry Company,** at Sparta, Mich., contemplates the erection of a new two-story office building to cost approximately $10,000.—F. J. H.

Toledo, Ohio

October 1, 1934.

With its varied industries, this area has experienced only a gradual easing off of manufacturing during the last few weeks. The most pronounced decline is noted in the production of motor car parts. This was expected and is not giving much concern, as it is a seasonal condition.

It is difficult to forecast very far ahead, but most well-informed industrialists are confident that vigorous production will be resumed again at no distant date.

Bondholders and creditors of the **Willys-Overland Company** have united on a plan to begin production of a new low-priced car in the Toledo plant starting about Nov. 1, it is announced. **David R. Wilson,** of Pontiac, Mich., one of the company's receivers reports that he will not ask permission in district court to resume operations and make 10,000 cars until after a conference in New York between bondholders and general creditors is ended. He expects, however, to file the application within a short time. —F. J. H.

Pacific States

Los Angeles, Calif.

October 1, 1934.

The **Continental Jewelers & Refiners** have opened offices here at 316 West 3rd St.

The **Gold Refiners** have located offices at 720 S. Grand Ave.

Business is opening up in the air conditioning line; 100,000 shares and other buildings in the country are ready for it. There is a $5,000,000,000 market for air conditioning and a fairly good start has already been made.

The **Leviton Manufacturing Company,** of Brooklyn, N. Y., manufacturers of electrical wiring devices have opened a large factory here, in the Dawes Bldg., 8th and Santee Sts.

The **Hoover Electric Cleaner Company** of North Canton, Ohio, have opened a branch factory and service department here, at 3006 West 7th St., in charge of **Hugh Murray.**

North American Aviation, main offices here, are talking of establishing an aircraft manufacturing plant in this city and of developing a new transport.

The **Menasco Manufacturing Company** have been organized to take over the aircraft engine plant owned by A. S. Menasco, president of the new corporation, have 300,000 square feet of floor space and plan to increase the output.

The **Vasco Electric Manufacturing Company** of 1212 Venice Blvd., are making a new patent soldering iron for home and factory use.

William P. Anderson, research engineer, has developed a new type of automobile bearing which is a high leaded bronze lined steel back type, already in use in airplane engines. It will mean great increase in engine speed and limitations as to its manufacture, have now been overcome.

Hallenscheid & McDonald of 1344 West Washington Blvd., are making a new line of bath room fixtures of brass, chromium plated and will be handled in the east by the American Encaustic Tiling Co. of New York City.

—H. S.

Metal Market Review

October 1, 1934

September was another dull month with prices on the whole unchanged or lower. The expected or hoped for Autumn rise in business did not materialize at all until late in the month and then only slightly.

Blue Eagle Copper remained unchanged at 9c but it is obviously under a strain. In order to maintain this price it was necessary for the copper producers to waive their sales quotas from September 15 to October 31st and also reduce their output, as the September consumption indicated fell below the "book" total of production quotas of 30,750 tons a month. The large consummers in the electrical, automobile, refrigerator and other industries, have been buying very little.

Zinc receded steadily throughout the month, from 4.20 to 3.95, for Prime Western, f.o.b. E. St. Louis. Stocks of concentrate in the hands of the Tri-State producers reached a new high figure and production throughout the industry was materially higher than current sales.

Lead also suffered a relapse, sliding from 3.60 f.o.b. St Louis to 3.45. At the latter price, considerable business was done it is stated, largely because the price seemed low rather than on account of any visible improvement in the industry.

Tin was almost unchanged throughout the month, beginning at 51.95 for Straits, going as low as 51.15 and closing at 51.40. Clearly there is no enthusiasm. The Advance Summary of Tin in 1933 released by the Bureau of Mines showed that American Imports for consumption rose to 63,700 long tons in 1933 from 34,800 in 1932.

Aluminum and Nickel were unchanged as usual. The aluminum situation is clearing, however, because of the settlement of the strike. The Advance Summary for Nickel in 1933 from the Bureau of Mines shows a tremendous rise in imports for consumption in 1933 over 1932, from about $4,700,000 to about $10,750,000.

Antimony, unlike the other fluctuating metals, was fairly firm, moving from 8.625 up to 9 and closing at 8.75. Statistics from the Bureau of Mines revealed a good rise in imports for consumption in 1933 over 1932, and also a fair increase of production in the United States as well as a rise in the recovery of secondary antimony from 6,450 to 7,400 tons.

Silver moved narrowly of course, but ended in the month firm because of rumors of inflation. From 49.625 it went as low as 49.25 and closed at 50.

Platinum was unchanged at $34.00, and **Gold at** $35.00.

Scrap Metals suffered from the dullness in the primary markets and the general lack of enthusiasm. Copper refineries cut their bids. The prices quoted for ingot metals (shown elsewhere on this page) it will be seen, are slightly lower than for last month. Lead and zinc scrap were also heavy. Sheet aluminum was strong, however, on demand from Japan.

An important discussion was held between scrap dealers and the Copper Code Authority on the proportion of the intake for which the refineries would pay prices based on Blue Eagle copper. It was felt in some quarters however, that under the conditions existing in the primary market, with sales quotas surrendered by the producers, there is little prospect of a higher settling basis for scrap.

The Bureau of Mines has released an Advance Summary of Secondary Metals in 1933 showing a rise in tonnage for 1933 from 545,000 to 722,000 and an increase in value from $65,000,000 to $101,000,000.

Ingot Metal Statistics

Non-Ferrous Ingot Metal Institute reports the average prices per pound received by its membership on Commercial Grades of six principal mixtures of Ingot Brass during the twenty-eight day period ending September 7.

Commercial 80-10-10 (1½% impurities)	10.271c.
Commercial 78% Metal	8.000c.
Commercial 81% Metal	8.250c.
Commercial 83% Metal	8.510c.
Commercial 85-5-5-5	8.759c.
Commercial No. 1 Yellow Brass Ingot	7.002c.

The Wrought Metal Market

October 1, 1934.

The month of September was not encouraging. Reports from New England showed an absence of improvement until the latter part of the month when the increases were small and spotty; this following the fact that during the month of August, Connecticut factories showed a slight decrease in the number of persons employed. At this time there is some pick-up evident but it is not what the trade had hoped for or expected.

It is reported also that the order books of the brass and wire mills are in an abnormally low state. The Chase Companies announced the reduction in wages for all salaried employees of 10 per cent.

Daily Metal Prices for September, 1934

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	3*	4	5	6	7	10	11	12	13	14	17	18 *
Copper c/lb. Duty 4 c/lb.												
Lake‡ (del. Conn. Producers' Prices)	...	9.125	9.125	9.125	9.125	9.125	9.125	9.125	9.125	9.125	9.125	9.125
Electrolytic‡ (del. Conn. Producers' Prices)	...	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
Casting (f.o.b. ref.)	...	7.875	7.875	7.875	7.875	7.875	7.875	7.875	7.875	7.875	7.875	7.875
Zinc (f.o.b. East St. Louis) c/lb. Duty 1¼ c/lb.												
Prime Western (for Brass Special add 0.05)	...	4.20	4.20	4.20	4.15	4.15	4.15	4.15	4.10	4.00	4.00	4.00
Tin (f.o.b. N. Y.) c/lb. Duty Free, Straits	...	51.95	51.50	51.45	51.15	51.40	51.375	51.70	51.70	51.50	51.45	51.35
Lead (f.o.b St. L.) c/lb. Duty 2⅛ c/lb.	...	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Aluminum c/lb. Duty 4 c/lb.	...	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3 c/lb.												
Electrolytic 99.9%	...	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Antimony (Ch.99%) c/lb. Duty 2 c/lb.	...	8.625	8.625	8.625	8.625	8.625	8.625	8.625	8.625	9.00	9.00	9.00
Silver c/oz. Troy, Duty Free	...	49.625	49.50	49.50	49.50	49.50	49.25	49.25	49.25	49.375	49.375	49.375
Platinum $/oz. Troy, Duty Free	...	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00
Gold—Official Price† $/oz. Troy	...	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00

	19	20	21	24	25	26	27	28	High	Low	Aver.
Copper c/lb. Duty 4 c/lb.											
Lake‡ (del. Conn. Producers' Prices)	9.125	9.125	9.125	9.125	9.125	9.125	9.125	9.125	9.125	9.125	9.125
Electrolytic‡ (del. Conn. Producers' Prices)	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
Casting (f.o.b. ref.)	7.875	7.875	7.875	7.875	7.875	7.875	7.875	7.625	7.785	7.625	7.861
Zinc (f.o.b. East St. Louis) c/lb. Duty 1¼ c/lb.											
Prime Western (for Brass Special add 0.05)	4.00	4.00	4.00	4.00	4.00	3.95	3.95	3.95	4.20	3.90	4.057
Tin (f.o.b. N. Y.) c/lb. Duty Free, Straits	51.40	51.55	51.55	51.60	51.45	51.50	51.35	51.40	51.95	51.15	51.491
Lead (f.o.b St. L.) c/lb. Duty 2⅛ c/lb.	3.55	3.55	3.50	3.50	3.50	3.45	3.45	3.45	3.60	3.45	3.542
Aluminum c/lb. Duty 4 c/lb.	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3 c/lb.											
Electrolytic 99.9%	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Antimony (Ch.99%) c/lb. Duty 2 c/lb.	9.00	9.00	9.00	9.00	8.75	8.75	8.75	8.75	9.00	8.625	8.757
Silver c/oz. Troy, Duty Free	49.50	49.50	49.375	49.375	49.50	49.50	49.625	50.00	50.00	49.25	49.484
Platinum $/oz. Troy, Duty Free	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00
Gold—Official Price† $/oz. Troy	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00

* Holiday.

Metal Prices, October 1, 1934

(Import duties and taxes under U. S. Tariff Act of 1930, and Revenue Act of 1932)

NEW METALS

Copper: Lake, 9.125. Electrolytic 9.00, Casting, 7.625.
Zinc: Prime Western, 3.90. Brass Special, 4.00.
Tin: Straits, 50.85. Pig, 99%, 50.10.
Lead: 3.45. **Aluminum,** 23.30. **Antimony,** 8.875.
Nickel: Shot, 36. Elec., 35.
Quicksilver: Flasks, 75 lbs., $75.50. **Bismuth,** $1.20.
Cadmium, 55. **Silver,** Troy oz., official price, N. Y., Oct. 2, 50⅛. **Gold:** oz., Troy, Official U. S. Treasury price Oct. 2, $35.00. **Scrap Gold,** 6½c. per pennyweight per karat, dealers' quotation. **Platinum,** oz. Troy, $34.00.

Duties: Copper, 4c. lb.; zinc, 1¼c. lb.; tin, free, lead, 2½c. lb.; aluminum, 4c. lb.; antimony, 2c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

INGOT METALS AND ALLOYS

	Cents lb.	U. S. Import Duty	Import Tax*
Brass Ingots, Yellow	7 to 8	None	4c. lb.[1]
Brass Ingots, Red	8¼to11	do	do
Bronze Ingots	9¾to12½	do	do
Aluminum Casting Alloys	15½to22	4c. lb.	None
Manganese Bronze Castings	20 to34	45% a. v.	3c. lb.[2]
Manganese Bronze Forgings	26 to38	do	do
Manganese Bronze Ingots	9 to13	do	4c. lb.[1]
Manganese Copper, 30%	11½to16	25% a. v.	3c. lb.[2]
Monel Metal Shot or Block	28	do	None
Phosphor Bronze Ingots	10 to12	None	4c. lb.[1]
Phosphor Copper, guaranteed 15%	13¼to15	3c. lb.[2]	do
Phosphor Copper, guaranteed 10%	11½to14	do	do
Phosphor Tin, no guarantee	61to75	None	None
Silicon Copper, 10%	18 to30	45% a. v.	4c. lb.[1]
Iridium Platinum, 5%	$36-37.50	None	None
Iridium Platinum, 10%	$37-38.50	None	None

*Duty is under U. S. Tariff Act of 1930; tax under Section 60 (7) of Revenue Act of 1932.
[1]On copper content. [2]On total weight. "a. v." means ad valorem.

OLD METALS

Dealers' buying prices, wholesale quantities:	Cents lb.	Duty	U. S. Import Tax
Heavy copper and wire, mixed	6⅜to 6⅝	Free	4c. per pound on copper content
Light copper	5½to 5¾	Free	
Heavy yellow brass	3⅜to 3⅝	Free	
Light brass	3 to 3⅛	Free	
No. 1 composition	4⅞to 5⅛	Free	
Composition turnings	4⅝to 4⅞	Free	
Heavy soft lead	3 to 3¼	2⅛c.lb.	None.
Old zinc	2¼to 2⅜	1½c.lb.	
New zinc clips	2¾to 3	1½c.lb.	
Aluminum clips (new, soft)	12¼to13¼	4c.lb.	
Scrap aluminum, cast	9¼to10	4c.lb.	
Aluminum borings—turnings	5 to5½	4c.lb.	
No. 1 pewter	30 to32	Free	
Electrotype or stereotype	2⅞to3	2⅛c. lb.*	
Nickel anodes	30 to33	10%	
Nickel clips, new	31 to33	10%	
Monel scrap	11 to18½	10%a.v.	

*On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, quantity, packing, etc., or discounts, as shown in manufacturers' price lists, effective since June 12, 1934. Basic quantities on most rolled or drawn brass and bronze items below are from 2,000 to 5,000 pounds; on nickel silver, from 1,000 to 2,000 pounds.

COPPER MATERIAL

	Net base per lb.	Duty*
Sheet, hot rolled	16c.	2½c. lb.
Bare wire, soft, less than carloads	12.75c.	25% a. v.
Seamless tubing	17.25c.	7c. lb.

*Each of the above subject to import tax of 4c. lb. in addition to duty, under Revenue Act of 1932.

NICKEL SILVER

Net base prices per lb. (Duty 30% ad valorem.)

Sheet Metal		Wire and Rod	
10% Quality	23.75c.	10% Quality	26.625c.
15% Quality	25.875c.	15% Quality	31.00c.
18% Quality	27.125c.	18% Quality	34.25c.

BRASS AND BRONZE MATERIAL

	Yellow Brass	Red Brass 80%	Comm'l. Bronze	Duty	
Sheet	14½c.	15⅜c.	16	4c. lb.	U. S. Import Tax 4c. lb. on copper content
Wire	15 c.	15⅞c.	16½	25%	
Rod	13 c.	15⅞c.	16⅜	4c. lb.	
Angles, channels	22½c.	23⅝c.	24	12c. lb.	
Seamless tubing	17 c.	17¾c.	18⅝	8c. lb.	
Open seam tubing	22½c.	23⅝c.	24	20% a. v.	No tax.

TOBIN BRONZE AND MUNTZ METAL

Net base prices per pound.	(Duty 4c. lb.; import tax 4c. lb. on copper content.)
Tobin Bronze Rod	16½c.
Muntz or Yellow Rectangular and other sheathing	17⅝c.
Muntz or Yellow Metal Rod	14 c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb. 32.80
Aluminum coils, 24 ga., base price, tons lots, per lb.....30.50

ROLLED NICKEL SHEET AND ROD

Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	.50c.	Cold Rolled Sheet	.60c.
Hot Rolled Rods	.45c.	Full Finished Sheet	.52c.

MONEL METAL SHEET AND ROD

Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base)	.35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	.40	Cold Rolled Sheets (base)	50

SILVER SHEET

Rolled sterling silver (October 2) 52c. per Troy oz. upward according to quantity. (Duty, 65% ad valorem.)

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.50	2c. lb.
Zinc sheet, 1200 lb. lots (jobbers' price)	10.25	2c. lb.
Zinc sheet, 100 lb. lots (jobbers' price)	14.25	2c. lb.
Full Lead Sheet (base price)	7.25	2⅜c. lb.
Cut Lead Sheet (base price)	7.50	2⅜c. lb.

BLOCK TIN, PEWTER AND BRITANNIA SHEET

(Duty Free)

This list applies to either block tin or No. 1 Brittannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs. or over .....15c. above N. Y. pig tin price
100 to 500 lbs. .....17c. above N. Y. pig tin price
Up to 100 lbs. .....25c. above N. Y. pig tin price
Up to 100 lbs. .....25c. above N. Y. pig tin price

Supply Prices on page 366.

Supply Prices, October 1, 1934

ANODES

Prices, except silver, are per lb. f.o.b., shipping point, based on purchases of 500 lbs. or more, and subject to changes due to fluctuating metal markets.

Copper: Cast ..... 16½c. per lb.
Electrolytic, full size, 13½c.; cut to size 14c. per lb.
Rolled oval, straight, 13¾c.; curved, 15¼c. per lb.
Brass: Cast ..... 15c. per lb.
Zinc: Cast ..... 9c. per lb.

Nickel: 90-92% ..... 44c. per lb.
95-97% ..... 45c. per lb.
99%+cast, 47c.; rolled, depolarized, 48c.
Silver: Rolled silver anodes .999 fine were quoted Oct. 2, from 53¼c. per Troy ounce upward, depending upon quantity.

WHITE SPANISH FELT POLISHING WHEELS

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	$2.95/lb.	$2.65/lb.	$2.45/lb.
10-12-14 & 16	2 to 3½	2.85	2.55	2.35
6-8 & over 16	1 to 2	3.05	2.75	2.55
6-8 & over 16	2 to 3½	3.00	2.70	2.45
6 to 24	Under ½	4.25	3.95	3.75
6 to 24	½ to 1	3.95	3.65	3.45
6 to 24	Over 3½	3.35	3.05	2.85

	Any Quantity		
4 to 6	Under ½, $5.00	½-1, $4.85	1 to 3, $4.75
1½ to 4	" 5.55	" 5.40	" 5.35
1 to ½	" 5.85	" 5.70	" 5.60

Extras: 25c per lb. on wheels, 1 to 6 in. diam., over 3 in. thick.
On grey Mexican wheels deduct 10c. per lb. from above prices.

COTTON BUFFS

Full disc open buffs, per 100 sections when purchased in lots of 100 or less were quoted July 2:

16" 20 ply 84/92 Unbleached	82.11
14" 20 ply 84/92 Unbleached	62.92
12" 20 ply 84/92 Unbleached	47.27
16" 20 ply 80/92 Unbleached	67.64
14" 20 ply 80/92 Unbleached	51.91
12" 20 ply 80/92 Unbleached	39.09
16" 20 ply 64/68 Unbleached	60.41
14" 20 ply 64/68 Unbleached	46.41
12" 20 ply 64/68 Unbleached	35.00

⅜" Sewed Buffs, per lb., bleached or unbleached 43c. to 1.09

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone C. P.	lb.	.12-.14½
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.04½-.05
Chromic, 100 and 400 lb. drums		.15-.15¼
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.03
Hydrochloric, C. P., 20 deg., carboys	lb.	.06½
Hydrofluoric, 30%, bbls.	lb.	.07-.08
Nitric, 36 deg., carboys	lb.	.05-.06¼
Nitric, 42 deg., carboys	lb.	.07-.08
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl, drums	lb.	.13½-.14½
Denatured, drums	gal.	.475-.476
Alum—Lump, barrels	lb.	.03¼-.04
Powdered, barrels	lb.	.03½-.05
Ammonia, aqua, com'l., 26 deg., drums, carboys	lb.	.02½-.05
Ammonium—Sulphate, tech., bbls.	lb.	.03½-.05
Sulphocyanide, technical crystals, kegs	lb.	.50-.58
Arsenic, white kegs	lb.	.04½-.05
Asphaltum, powder, kegs	lb.	.23-.41
Benzol, pure, drums	gal.	.41
Borax, granular, 99½+%, ton lots	lb.	.02¼-.02¾
Cadmium oxide, 50 to 1,000 lbs.	lb.	.55
Calcium Carbonate (Precipitated Chalk), U. S. P.	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05½-.06
Chrome, Green, commercial, bbls.	lb.	21½-23½
Chromic Sulphate, drums	lb.	.33-.55
Copper—Acetate (Verdigris)	lb.	.21
Carbonate, 53/55% cu., bbls.	lb.	.15-.16½
Cyanide (100 lb. kgs.)	lb.	.38-.40
Sulphate, tech., crystals, bbls.	lb.	4.55-5c.
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus Martis (Iron Oxide) red, tech., kegs.,	lb.	.07
Dextrin, yellow, kegs	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	30.00
Fluorspar, bags	lb.	.03½
*Gold Chloride	oz.	$18¼-23
Gum—Sandarac, prime, bags	lb.	.50
Shellac, various grades and quantities	lb.	.21-.31
Iron Sulphate (Copperas), bbls.	lb.	.01½
Lead—Acetate (Sugar of Lead), bbls.	lb.	.10-.13½
Oxide (Litharge), bbls	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, (Wood Alcohol) 100% synth., drums	gal.	.42½
Nickel—Carbonate, dry, bbls.	lb.	.35-.41
Chloride, bbls.	lb.	.18-.22
Salts, single, 425 lb. bbls.	lb.	.12-.13
Salts, double, 425 lb. bbls.	lb.	.12-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.07½-.08425
Potassium—Bichromate, casks (crystals)	lb.	.08⅝
Carbonate, 96-98%	lb.	.08¾
Cyanide, 165 lbs. cases, 94-96%	lb.	.57½
Gold Cyanide	oz.	$19.10*
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge—Nickel, 100 lb. lots	lb.	.08
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.07½
*Silver—Chloride, dry, 100 oz. lots	oz.	.44
Cyanide, 100 oz. lots	oz.	.46½-.53
Nitrate, 100 ounce lots	oz.	.36
Soda Ash, 58%, bbls.	lb.	.0252
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.22
Beryllium fluoride ($2NaF.BeF_2$)	lb.	4.30-7.00
Gold Cyanide	oz.	$17.10*
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate, granular, bbls.	lb.	3.55-3.70
Nitrate, tech., bbls.	lb.	.02¼
Phosphate, tribasic, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.01½
Stannate, drums	lb.	.34-.37
Sulphocyanide, drums	lb.	.30-.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.39
Tripoli, powdered	lb.	.03
Trisodium Phosphate—see Sodium Phosphate.		
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc—Carbonate, bbls.	lb.	.11-.12
Cyanide (100 lb. kegs)	lb.	.38
Chloride, drums, bbls.	lb.	.07½-.10
Sulphate, bbls.	lb.	.033-.037

* Gold and silver products subject to fluctuations in metal prices.